



Moultonborough, New Hampshire is connected to the global internet through many high capacity data circuits. Most of the town connections are via “last mile” copper technology. This allows people and businesses within the town’s dot on the map to be real-time peers with the world, and improves the economic health and quality of life for those that embrace the information age.

There is a problem though. While over 95% of 5580 properties (Source: NH Electric Coop) can connect, too many do not have access to a broadband service that is available, or sufficiently fast, affordable and reliable.

The town’s financial assets includes a Communications Technology Capital Reserve fund, subsidized by a 2% franchise fee on local cable TV customers. The fund was voted in by the town in 2007, to promote development of communications infrastructure to underdeveloped parts of town. Through BOS direction, the fund can help the town ensure all have acceptable internet service.

This report is the result of efforts since 2013 of the LRPC, UNH, NH-DRED and especially the town’s broadband working group, to inventory residential services, map internet speeds and identify the unserved areas. Expansion feasibility, costs, and deployment are topics for of future work.

The working group’s recommendations are on the next page, followed by supporting information. Please contact members of the 2014 broadband working group with questions.

Town staff: Carter Terenzini / Bruce Woodruff - Members: Scott Bartlett / Jean Beadle / Chuck Connell / Joe Cormier / Bill Gassman / Rich Kumpf

Broadband Working Group 2014 Recommendations to Select Board



- Short term (12 months):
 - Adopt goal of 100% availability – develop an expansion cost sharing formula
 - Solicit proposals to extend service to pre-identified unserved areas
 - Ensure zoning/planning regulations address internet availability
 - Create a volunteer digital assistance program
- Long Term (1-3 years):
 - Publish guide on town's providers and how to choose
 - Document unserved properties on assessment records
 - Map and market residential and business class capacity
 - Revisit goals and investments every three years

These recommendations to the Moultonborough Select Board is a 2014 snapshot, recognizing that broadband technology and best practices are still evolving. Short term recommendations are for immediate action and long term recommendations are intended to be accomplished over three years.

Short term:

1. Adopt a goal of 100% internet availability to the curb, so that all property owners can choose to connect. Direct town staff and volunteers to research solutions for unserved areas and to develop to a cost sharing formula that funds expansion of the communication infrastructure. This will be a best-effort goal and not a property owner's right.
2. Direct that proposals be solicited from broadband providers, to extend service into pre-identified unserved areas. Be ready to repeat the process if new unserved areas are identified.
3. Ensure zoning/planning/building codes include broadband availability for new development.
4. Create a volunteer digital assistance program to manage expansion activity and help businesses and residences get more value and productivity from online services.

Long term:

1. Charge the digital assistance program to expand the provider matrix, developed by the broadband working group, into a guide for residences and businesses.
2. Document unserved properties, possibly via property assessment records.
3. In support of the town's marketing effort, continue to improve the town's broadband footprint documentation, including mapped areas where business class service is available.
4. Plan to revisit goals and investments every three years.

Broadband Issues in Moultonborough

- **Economic**
 - Business adoption of digital practices is difficult yet important
 - Extending broadband service to unserved areas is expensive
- **Social**
 - Complacency – public believes that broadband service is adequate
 - Adoption – Internet is only 20 years old, and still difficult for some to use
- **Political/regulatory**
 - Local government role is unclear – especially without precise data
 - Few regulations to demand improvements from carriers
 - No advantages to negotiate provider’s franchise contracts
 - Difficult to attract competitive providers
- **Technical**
 - Limited network design and operation skills on town staff
 - Imprecise or nonexistent maps of infrastructure capacity, gaps and reliability



There is a lot of good news about broadband in Moultonborough, but issues remain.

- **Economic:** The internet helps to power the economic engine and the town’s prosperity. Established businesses are under competitive pressure but many find it difficult to adopt digital approaches to advertising, reviews, reservations, purchasing and payments. Locals and tourists increasingly expect to find and interact with businesses online, so those without a good online presence may lose business. For the town, the expense of expanding the broadband footprint to unserved properties is an economic challenge.
- **Social:** From businesses to residents, complacency is a deterrent to change. A majority of people have sufficient internet capacity, but some are unenthusiastic about the town investing in infrastructure expansions. Too many businesses make minimal investments in digital techniques and don’t plan more. The information age revolution is young and maturing quickly, yet is still difficult for many to fully embrace. Advances in online learning, healthcare, personal interaction, search, navigation, shopping and e-government can increase economic health and quality of life, yet many are not comfortable adopting what is available. A digital divide slows down efforts to move forward during economic challenging times, but some are comfortable with that. .
- **Political/Regulatory:** The role of local government in expanding infrastructure or helping businesses adopt digital techniques is unclear, especially since it is also unclear at the state and federal levels. There are also few regulations on providers, even as their market share, franchises and lobbying efforts have made it difficult for new broadband providers to compete. Lack of regulations also results in lack of precise data for planning improvements.
- **Technical:** The will and means to expand the residential internet footprint to 100% is not enough. The town’s staff has limited skills and time to ensure the best choices. This problem is made worse by the imprecise or missing data about the existing footprint and backhaul capacity of providers.

Moultonborough Government Broadband Efforts



- 2007 - Created tech fund (2% cable franchise fee)
- 2012 – Solicited improvement bids from providers – unsuccessful
- March 2014 - Formed broadband working group (LRPC/UNH driven)
- Summer 2014 – Conducted “speed test” campaign

A graphic for an internet speed test campaign. It features a speedometer icon at the top center with "9.83" on the left and "2.17" on the right. The text "Vacationers" is on the left and "Businesses" is on the right, both in blue, slanted font. Below the speedometer, it says "Property Owners" in blue, followed by "Help Moultonborough...." in red, and "Take the Internet Speed Test!" in bold red. A small circular logo is on the bottom left. The text "We need your help to map areas of town without internet access or where speeds are too slow." is in the center. Below that is the website "IWantBroadbandNH.org/speed-test" in red, and "Questions? Email: iwantbroadband@roadrunner.com" in black at the bottom.

For its broadband planning activity, Moultonborough it is held up as a model town throughout the state. Adopted by the town in 2007, the Communications Technology Capital Reserve fund, is unique, and other towns are looking for follow-on information about how it is being used. This fund is intended to promote development of communications infrastructure to underserved areas of town, and is a perfect source of money to expand broadband. While the account has grown to over \$180,000, no money has yet been spent for its intended purpose.

In 2012, the town administrator ask several providers for bids to expand infrastructure. Only Fairpoint responded, and no agreement was reached. In March 2014, a statewide broadband initiative (information at iwantbroadbandnh.org), sponsored by UNH, LRPC and DRED, chose Moultonborough to participate in a broadband planning pilot program. As part of the pilot, the town administrator formed a Broadband Working Group, which met during 2014 and more-or-less followed the pilot program process. Sponsor members met with the town’s working group to identify issues, possible resolutions and ways to accomplish the goals.

The working group planned and executed a speed test campaign during the summer of 2014, encouraging property owners, businesses and vacationers to take the test operated by UNH, as part of its “iwantbroadbandnh.org” measurement service. Unserved properties were also identified. The results are presented in this report.

Definition of Residential Service



- Used for measuring goals and evaluating expansion options
- Served: FCC defined speeds = > 10 Mbps download / 1 Mbps upload
- Underserved: 768Kbps to 10 Mbps download, under 1 Mbps upload speed
- Unserved: Under 768Kbps download speed
- Other service criteria
 - Over 99.9% availability (down less than 1 hour/month)
 - Under \$60/month for qualifying service
 - Data volume cap above 300 gigabytes/month
 - Financially stable company



What does “served” by broadband mean? Unfortunately, there are multiple definitions, and it is a moving target. For residential service, the working group decided to adopt the definition of the US Federal Communications Commission (FCC) as a starting point. The FCC uses its definition when considering grants for expansion under the Connect America program.

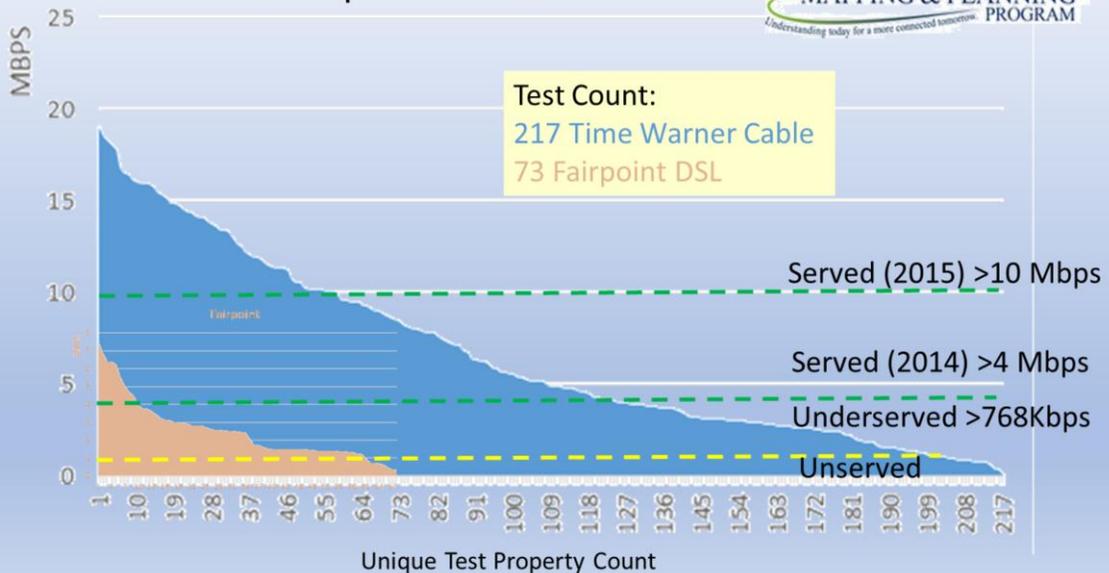
In December 2014, the FCC’s updated its definition of “served” minimum download speed from 4 to 10 megabits/second. The town’s definition changed with it, recognizing that expansion efforts may not always be ready to meet the new spec. A clear definition is important, because it helps to identify and measure problem areas, and report progress towards the 100% goal. As with the FCC, it also provides benchmark specifications for expansion investments.

In 2014, residential speed specifications to be served in Moultonborough include an advertised rate at or greater than 10 megabits per second download speed and 1 megabits per second upload speed. Advertised download speed between 768 kilobits per second and 10 megabits per second is considered underserved and those below 768 kilobits per second are unserved.

The FCC only considers speed when defining served. For Moultonborough measurement and investments, the definition goes beyond speed to include affordability, reliability and viability.

1. At least 99.9% reliability, measured as less than 1 hour of downtime per month.
2. Under \$60 per month for at least 10 megabits per second download speed.
3. No data cap or if there is one, it is at least 300 gigabytes per month.
4. The provider is a financially stable company.

Summer 2014 Speed Test Data

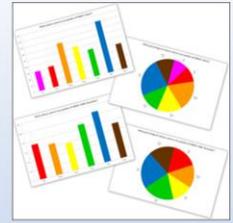


The town sponsored internet speed test campaign ran during the 2014 summer tourist season, June through August. While over 400 took the test, analysis is based on a snapshot of data from 290 identified addresses. The majority taking the test were connected via the Time Warner Cable Internet service, and most of the remainder were connected via Fairpoint DSL Internet service. When using the 2014 definition of served (4 Mbps), more than half of those using cable provided internet were measured as meeting acceptable service speed, while most of those on DSL measured in the underserved category. With the new FCC's 2015 speed spec (10 Mbps), town coverage does not look as good. Here, only about 25% of cable and 0% of DSL subscribers meet the spec.

The analysis, while somewhat disparaging of DSL, and to some degree cable, must be tempered with the low precision of the testing methods. Over the summer, the UNH speed test service had frequent congestion problems, causing some measurements to be slower than they should have been. The relative differences between cable and DSL are valid, but results below the median values includes data collected while UNH was experiencing its technical issues. Another factor worth mention is the equipment upgrades which Fairpoint installed during the summer of 2014. Its advertised speeds for many areas have increased from 3 to 15 megabits per second, and some of this occurred after the peak of the testing campaign.

One conclusion is that when practical, a cable solution should be selected over a telephone line DSL solution. Cable advertises up to 50 megabits per second at most locations while telephone line DSL offers a maximum of 15 megabits per second and only when close to the hubs.

Moultonborough Speed Test Findings

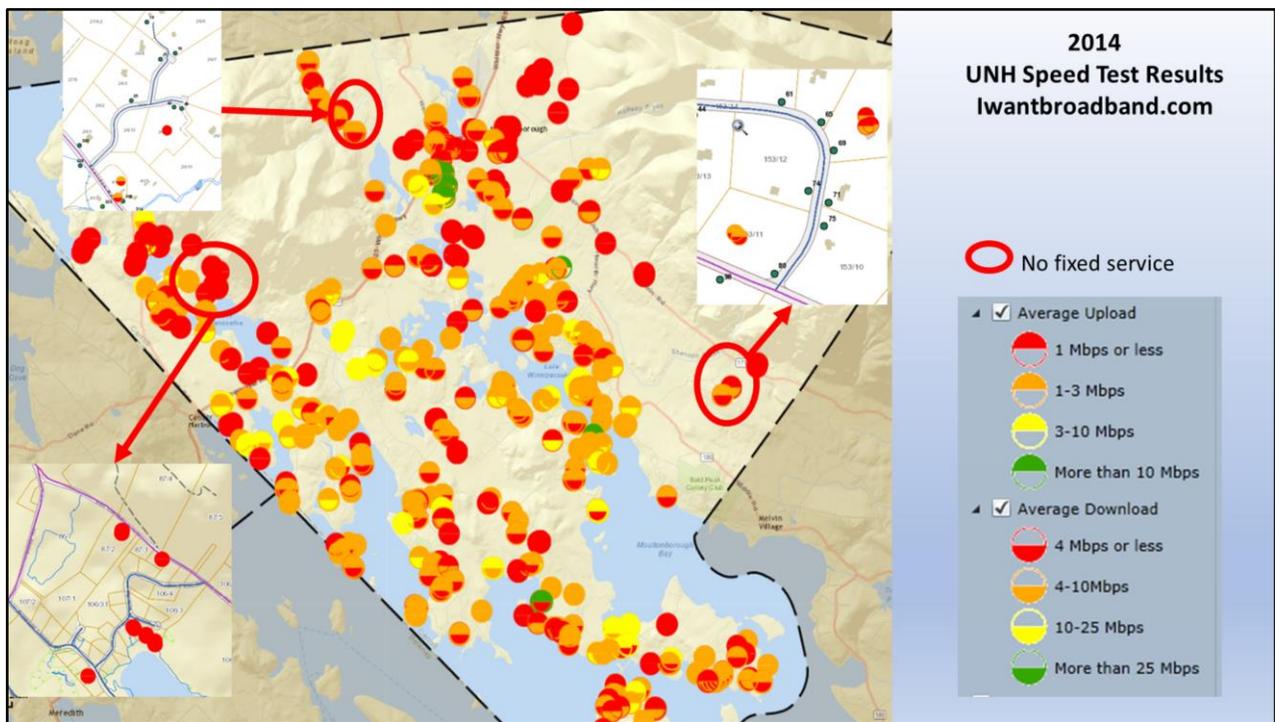


- Moultonborough is well served, including business grade
- About 10% participated in speed test – good geographical mix
- TWC is used 3X more frequently than Fairpoint service.
- TWC Cable mean-average speed is 2X that of Fairpoint DSL
- Precision issues arose with UNH testing/mapping service
- Some complain about provider service consistency or reliability
- Three unserved areas identified
 - Under 40 properties, all served by underground utilities

The speed test campaign generated a lot of data. Not all has been analyzed but initial findings suggest good results. Moultonborough is well served and has excellent business grade fiber based capacity along the Route 25 commercial zone. Data was gathered from almost 10% of properties, showing broad geographic representation. There were three times the number of Time Warner Cable customers testing as those from Fairpoint. TWC customers were measured as having a mean-average (half faster, half slower) speed of 2 times faster than Fairpoint customers. Testing precision issues restrict how deep the analysis can go.

A few residents reported dissatisfaction with their provider's consistency or reliability. For example, the internet is slow for some on summer weekends. Reliability, consistency and backhaul capacity was not part of this study, but would be a good follow-on study to pursue. The root of some complaints will likely be the customer's own wiring or equipment.

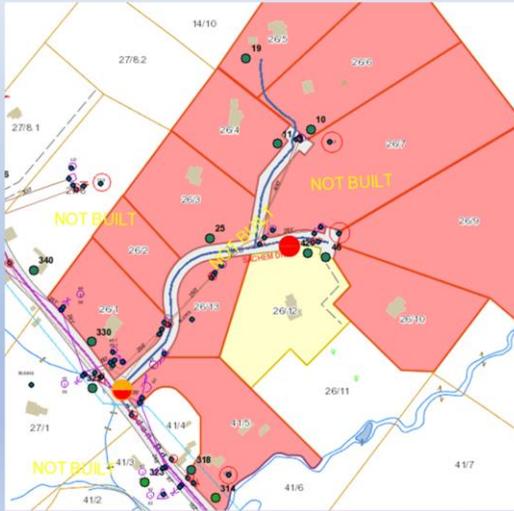
An important aspect of the summer speed-test campaign was finding those that are unserved by residential internet service. This information was added to data previously gathered by town staff and the LRPC. All notices about the test, including one in the tax bill, asked for reports of "service unavailable". As a result, three unserved areas are identified and are candidates for tech fund expansion grants. The Broadband Working Group expects other unserved areas to self-identify after an expansion grant program starts. Under 40 unserved properties have been identified, but it surely possible that another 50+ are yet unidentified. After two years of searching for unserved properties, the recommendation is to start fixing what is known and build up a queue for newly identified unserved areas.



While not without challenges, the advantage of using the speed-test from UNH was that the town received data about those taking the test. Address, speed and provider data was integrated into the town's GIS mapping system. Many areas of town achieved more than 4 megabits per second download speed, the minimum served rate in effect at the time of the test. The above view of the map shows the extensive geographic coverage of those taking test. The close-ups show examples of how the data can help the town diagnose reports of unserved or underserved capacity. The three identified unserved areas are marked on the above map with a red circles and a close-up overlay. Speeds below the 2014 four megabit benchmark are scattered sparsely across town, as seen where the lower half of the circle is red. Some of these red circles are due to testing problems, while others may represent capacity issues or subscriber choice of an inexpensive but throttled service. The data is not precise enough to find anything but broad areas of slow capacity, however clusters of slowness are noted east of the town village, and warrant more investigation.

The top concern should be those that are unserved. Over a dozen reports of "service not available" came into the working group. After investigation, most were resolved by helping the property owner understand their options. The three widely separated unserved locations, each with four to twenty properties. Access via existing fixed and/or mobile wireless providers is not considered served in this analysis, due to speed, service quality or cost issues based on data volume charges. More unserved areas will be identified as the town starts to correct what has already been identified.

Unserved: Sachem/Abenaki

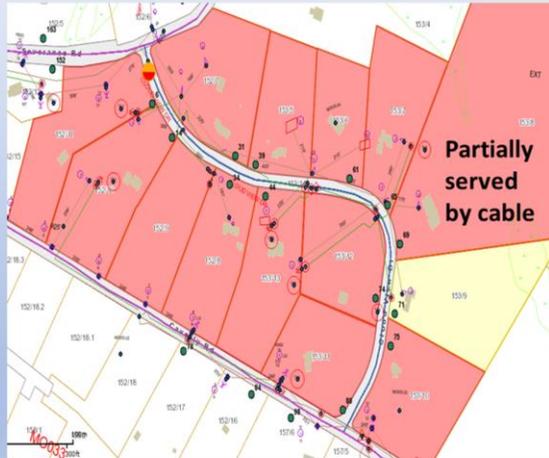


- Underground utilities
- Sandwich based telephone
- DSL mostly unavailable
- Cable on Sheridan Rd. but no conduit available
- Eight lots; five built
- Potential Solutions:
 - Trenching
 - Shared conduit
 - Citizen wireless
 - DSL amplifiers

The lack of service in the Sachem/Abenaki neighborhood triggered the formation of the tech fund in 2007, and the neighborhood is still largely unserved. While telephone service is available via Fairpoint, the wires come from the Sandwich exchange, located on Great Rock Road, and is too far away to provide adequate DSL service. One property in the neighborhood subscribes to DSL, but it is too slow to be useful. Fairpoint refuses to take orders for DSL at other properties in the neighborhood. TWC cable is close-by, on Sheridan Rd, but the neighborhood uses underground utilities and there is no conduit available for the cable. The neighborhood has eight lots, with three still undeveloped. Possible solutions include trenching to add cable, convincing Fairpoint to share their conduit (unlikely), installing a Wi-Fi repeater at a neighbor's property or convince Fairpoint to install new DSL hubs.

Some in this neighborhood use a fixed wireless system from Lakes Region Wireless. This provides a WiFi like signal from the Ossipee mountains, and backhauls traffic into a Metrocast internet circuit. The speed and volume capacity of this service is woefully inadequate for modern internet use and the long term viability of the provider is in question.

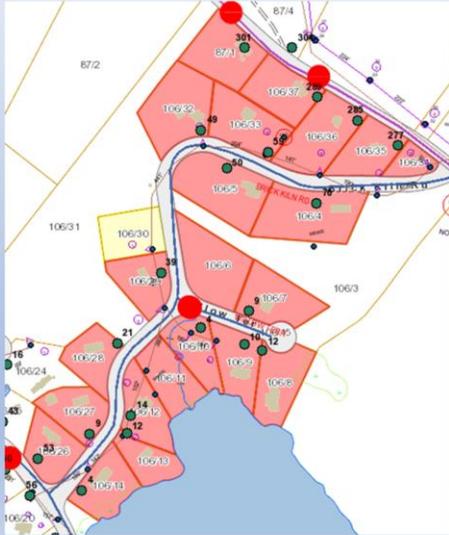
Unserved: Cloudview Drive



- Underground utilities
- TDS telephone – No DSL
- TWC Cable covers top half of road and is on poles nearby on Caverly Rd.
- only 3 unserved
- Solution is trenching and conduit, new poles or citizen wireless system

Cloudview Drive uses underground utilities and is mostly served with cable, but there are three properties beyond the end of the underground cable feed. Not all the unserved properties are developed. The telephone company in this area is TDS, but it offers no DSL to customers in this neighborhood. The TWC cable passes nearby, along Caverly Rd. Solutions include expansion of the cable to the remainder of the street via new trenches, installation of a citizen Wi-Fi repeater or install a few poles from Caverly Rd to serve the southeast end of Cloudview.

Unserved: Brick Kiln Rd.



- Underground utilities
- Fairpoint DSL– some unserved, others very slow
- No TWC Cable till western end of Sibley Rd.
- 29 properties in community
- Solutions: Fairpoint booster, cable expansion or fixed wireless

The Brick Kiln Road area is served by underground utilities. Fairpoint telephone lines are available but there is no cable infrastructure. A poll of the 29 property owners indicated there are several using DSL, but at unacceptable speeds. Fairpoint has refused to subscribe others to DSL service. Of note, this area also has poor mobile Wireless signal, which is normally not an acceptable solution for residential service due to data volume charges, but is still an alternative where the signal is strong enough. While it is worth getting a bid from the cable company to expand for 25+customers, Fairpoint should also be asked to quote the installation of a new DSL hub or DSL amplifiers. Working with a fixed wireless company may also be viable, although that would require town investment in expanding and updating technology of the company.

Appendix

- Other material provided by the 2014 Broadband Working Group
 - Provider summary
 - Report glossary of terms
 - Provider matrix spreadsheet with provider details and complete glossary

Other material provided by the Broadband Working Group

Provider summary

Report glossary of terms

Provider matrix spreadsheet with provider details and complete glossary

Internet Providers in Moultonborough

(summary from group's matrix)

- **Wired**
 - **Cable**
 - Time Warner Cable
 - Metrocast (very limited area)
 - **Telephone DSL**
 - Fairpoint (multiple exchanges)
 - TDS (very limited area)
 - **Business grade fiber**
 - 186 Communications
 - Fairpoint
 - Time Warner Cable
 - Verizon
- **Wireless**
 - **Cellular**
 - Verizon
 - AT&T
 - Sprint
 - US Cellular
 - **Fixed**
 - Cyberpine
 - Lakes Region Wireless
 - **Satellite**
 - Hughes
 - Dish
 - Wild Blue

The 2014 Moultonborough Broadband Working Group produced a matrix of providers. It contains information about services, prices, feasibility for expansion and more. An electronic copy of the spreadsheet was submitted with this report to the select board and is also available upon request.

Wired

Cable: Time Warner Cable; Metrocast (very limited area)

Telephone DSL: Fairpoint (multiple exchanges); TDS (very limited area)

Business grade fiber: 186 Communications; Fairpoint; Time Warner Cable; Verizon

Wireless

Cellular: Verizon; AT&T; Sprint; US Cellular;

Fixed: Cyberpine; Lakes Region Wireless

Satellite: Hughes; Dish; Wild Blue

Report Glossary – Part 1

- **Availability** – Connections are possible at a property, to an internet service, often meaning at the border (or curb) of the property. Caveats may be added based on service characteristics.
- **Backhaul** – Methods to transport data from a region to major internet connection points. Capacity, reliability and use are important measurement characteristics.
- **Broadband** – Always on internet infrastructure, with speeds above 768 kilobits per second, supplied by a variety of technologies.
- **Business grade** – High speed, capacity and reliability, normally with equal upload and download capacity. May be delivered via fiber optics. Speeds from 1.5 to 1000 megabits/second common.
- **Cable internet** – Internet service delivered by a copper cable infrastructure, with maximum residential offerings of 50 to 100 megabit per second. It may also deliver television, telephone and security services.
- **Cellular wireless** – Internet services provided to devices that are not fixed, across broad geographies. Typically provided regional radio towers operated by a mobile cell telephone service provider.
- **Citizen wireless** – Neighborhood arrangements where one internet served property acts as a relay point for an unserved property. Typically accomplished via specialized Wi-Fi equipment.

A more complete glossary of broadband terms is included with the broadband matrix spreadsheet. The glossary here is for the terms used in this report.

Availability – Connections are possible at a property, to an internet service, often meaning at the border (or curb) of the property. Caveats may be added based on service characteristics.

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Report Glossary – Part 2

- **Communications Infrastructure** – Any technology, wired or wireless, that delivers communication services, such as TV, Internet and telephone to town properties.
- **Data cap** – Volume of data, typically measured in gigabytes (GB), is included in a customer's subscription for internet services. Above the cap, fees may be added or service degraded.
- **Digital divide** – The cultural differences between those that use the internet for communications and personal productivity and those that don't.
- **DSL internet** – Digital Subscriber Line, or DSL, is a family of technologies that uses copper telephone wires to deliver internet to subscribers within three miles of fiber connected remote hubs. Residential maximum speed ranges from 3 to 15 megabits per second.
- **Federal Communications Commission (FCC)** – A US government agency that regulates interstate and international communications by radio, television, wire, satellite and cable.
- **Fiber optics** – A technology using glass, rather than copper, to transmit data at extremely high speeds. Used for backhaul, business grade, and in some cases residential service.

Communications Infrastructure – Any technology, wired or wireless, that delivers communication services, such as TV, Internet and telephone to town properties.

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Report Glossary – Part 3

- **Fixed wireless** – Internet service delivered to a fixed location, such as a residence, via line of sight radio transmissions. Uses technology similar to Wi-Fi.
- **GIS Mapping System** – Geographic Information System that supports many layers of data represented on a map, for example, the cable infrastructure and speed test results.
- **Information age** – Use of information as a driver for the global economy. It is the evolution from agricultural and industrial ages. In 2015, it is still evolving and disrupting to some processes.
- **Internet Provider** – A commercial business that offers internet service in a specific area
- **Reliability** – Percentage of time, typically monthly, a service is working nominally, up to the customer's premise. Customer problems and schedule downtime are not normally included in the calculation.
- **Served** – Internet service that meets minimum speed specifications, but may include other criteria such as cost and reliability. Used for measuring community availability and awarding expansion grants.
- **Speed** – Measurement of advertised or actual internet service or infrastructure capacity in bits per second.
- **Speed test** – An application that measures end-to-end network throughput, in bits per second, while delivering data between two connected devices. Results vary as there is no methodology standard.

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