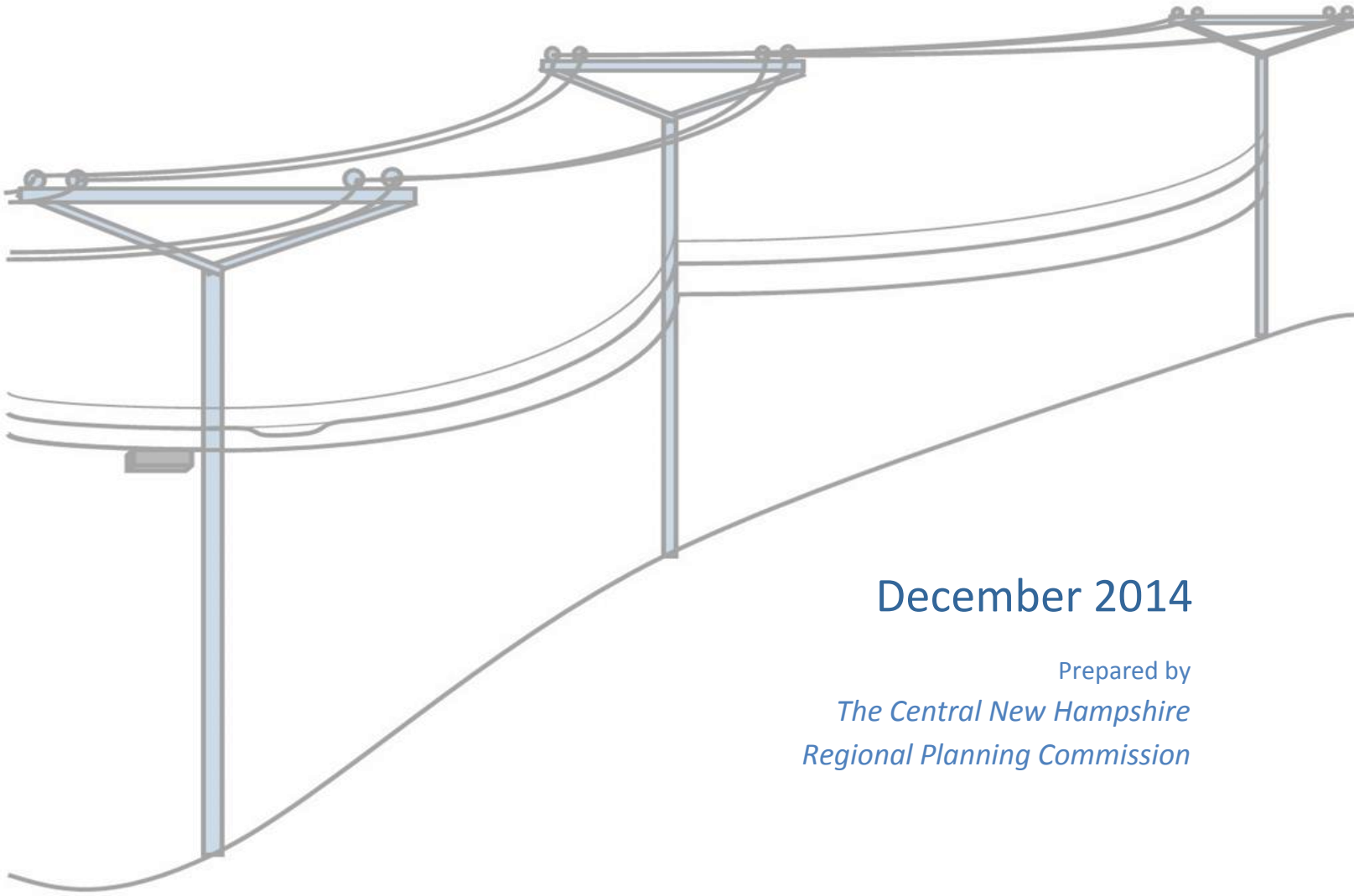
Central New Hampshire Region

Broadband Plan

Allenstown Boscawen Bow Bradford Canterbury Chichester Concord Deering Dunbarton Epsom
Henniker Hillsborough Hopkinton Loudon Pembroke Pittsfield Salisbury Sutton Warner Webster



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Prepared by
The Central New Hampshire
Regional Planning Commission

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Central New Hampshire Regional Planning Commission
28 Commercial Street, Concord, NH 03301
P: 603.226.6020 F: 603.226.6023
cnhrpc@cnhrpc.org www.cnhrpc.org

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Broadband Stakeholders Group Participants:
Bob Cole, *Town of Loudon*
Carol Miller, *DRED*
David Karrick, *Town of Warner*
David Klumb, *Town of Webster*
Gary Hendley, *New Hampshire Technical Institute*
George Saunderson, *Town of Loudon*
Gloria McPherson, *Former Planner, City of Concord*
Jim Bingham, *Town of Warner*
Jim Snech, *Concord Hospital*
Mark Starry, *Concord Hospital*
Oscar Gala Grano, *Town of Salisbury*
Paula Amato, *New England College*
Robyn Payson, *Town of Hillsborough*
Scott Osgood, *Town of Henniker*
Stephen Henninger, *Former Assistant Planner, City of Concord*

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BACKGROUND

The New Hampshire Broadband Mapping and Planning Program (NHBMPP) was a comprehensive, multi-year initiative that began in 2010 with the goal of understanding where broadband was currently available in New Hampshire and how it could be improved and made more widely available in the future. Funded through the National Telecommunications and Information Administration (NTIA), the NHBMPP was part of a national effort to expand broadband access and adoption.

The NHBMPP was managed by GRANIT (Geographically Referenced Analysis and Information Transfer), a division within the Earth Systems Research Center at the University of New Hampshire (UNH), and was a collaboration of multiple partners. Partners included the NH Office of Energy and Planning (OEP), NH Department of Resources and Economic Development (DRED), UNH Cooperative Extension (UNHCE), and the state's nine regional planning commissions (RPCs).

The NHBMPP was comprised of several components, including a broadband availability inventory and mapping effort and a suite of planning and technical assistance initiatives. For a full description of the various program components, please refer to **Appendix A**.

As part of the effort to improve understanding of broadband at the regional level, the nine regional planning commissions (RPCs) in New Hampshire implemented a multi-year planning process to produce a regional broadband plan. With the assistance of a broadband stakeholder group (BSG), comprised of individuals representing a wide range of sectors throughout the region, the RPCs documented broadband needs and gaps in coverage, identified barriers to broadband adoption, and drafted goals, objectives and strategies in an effort to improve access to information on broadband technology and deployment and how utilization can be improved in the region.

The RPC's regional broadband plans can serve as a resource for interested communities, policy makers, businesses, institutions, and residents to better understand current availability and strategic options for improved broadband access and planning opportunities to facilitate deployment of broadband in all regions. The information and strategies from all nine regional plans also served as the framework for the statewide broadband plan released by the University of New Hampshire as part of NHBMPP.

WHAT IS BROADBAND?

Broadband refers to high-speed Internet access that is always on and is faster than the dial-up access that was traditionally used in the initial phases of Internet connection. Broadband includes several high-speed transmission technologies commonly used today such as, Digital Subscriber Line (DSL), Cable Modem, Fiber, Wireless and Satellite. Broadband functions, applications and technologies are continually changing as new technologies emerge and demand for faster, higher-capacity broadband continues to increase.

Broadband is defined by the National Telecommunications and Information Administration (NTIA), as "advanced communications systems capable of providing high-speed transmission of services such as data, voice, video, complex graphics, and other data-rich information over the Internet and other networks." Stakeholders often seek to define broadband in terms of download and upload speeds, in part because these are discrete, convenient, and standardized metrics. Download and upload speeds

measure the amount of data transmitted per second, as reported in kilobits (kbps), megabits, (mbps) and gigabits (gbps).

For the purposes of discussion and planning, the New Hampshire Broadband Mapping and Planning Program (NHBMPP) developed a broadband matrix to assist stakeholders in understanding the diverse levels of broadband available in the state today, and the typical functions a user might be able to perform within a range of download and upload speed tiers. Using these tiers, the Program established broadband availability categories ("served", "underserved", and "unserved") to describe access to broadband service. To review the NHBMPP broadband matrix, please refer to **Appendix B**.

Broadband functions, applications and technologies are continually changing. Only 15 years ago, a 56 Kbps connection was sufficient to conduct most business on the Internet. Today, in order to use many Internet applications successfully, a minimum download speed of 1.5 Mbps is required. This trend towards increasing requirements for bandwidth capacity is expected to continue into the future, and the broadband matrix of uses and categories of served, underserved, and unserved will evolve as well.

- For more information on the NHBMPP, visit www.iwantbroadbandnh.org
- To take a customized speed test to measure your actual delivered broadband upload and download speeds, visit www.iwantbroadbandnh.org/speed_test

For more information on understanding broadband, how it works and why it is important as a resource in our communities please refer to **Appendix C**. This section also includes a summary of the role of broadband use in five of the sectors that are a focus of analysis in the Central NH Region - Education, Healthcare, Community Support/Government, Public Safety and Economic Development.

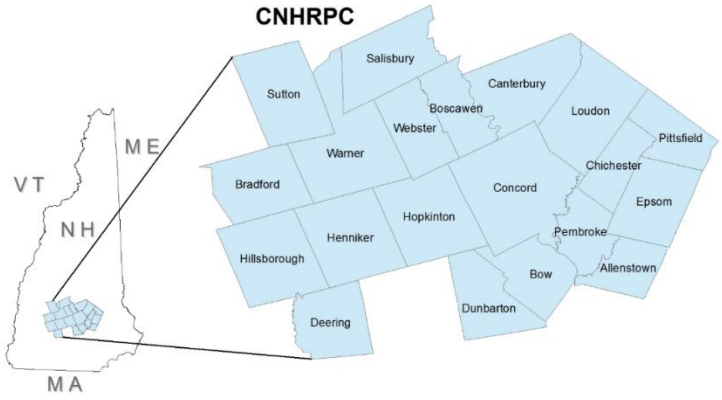
VISION

Every municipality, home, business, and place of education in the Central NH Region has access to reliable, high quality, affordable, high speed broadband infrastructure and services.

INTRODUCTION

Broadband has grown in importance the last few decades and is now recognized as an important factor in economic growth, job creation, global competitiveness and an improved quality of life. It has quickly become a basic necessity and as important as other infrastructure such as electricity and transportation. It has regional implications not only when looking for solutions to accessibility issues but also from the broader perspective that sharing knowledge and experiences in the region can benefit a municipality's approach to broadband planning at the local level.

The Central NH Regional Planning Commission (CNHRPC) is comprised of 20 communities and its mission is to be a resource on land use and planning issues by providing local planning assistance and facilitating initiatives that are more regional in nature such as transportation, water resources and now broadband. CNHRPC also recently completed the preparation of the Central NH Regional Plan, one of the responsibilities identified in RSA 36:47, the statute that establishes the regional planning commissions and outlines their duties. This Broadband Plan is one example of a regional focus on issues that have an impact on the region's communities.



With this regional connection in mind, this Plan is tied to CNHRPC's role as a regional resource for its communities. Broadband has evolved in recent years to the point of being a factor in many aspects of local planning and development. The completion of this plan is very timely with many communities now considering incorporating broadband discussions into master plans and other planning functions. The purpose of this Plan is twofold: to conduct a broadband needs assessment for the region and to develop strategic solutions to some of the identified challenges. Town officials, other community leaders and interested residents can benefit from the Plan's information base as well as the action items that address needs identified during the process. The Plan sets achievable goals and objectives for the region and identifies realistic implementation/action items. While it is designed to meet the unique goals and needs of the Central New Hampshire (NH) Region, it can be used to inform state efforts in pursuing a broader broadband strategy. An important long term goal is that the plan will provide structure to CNHRPC's work in facilitating the region's vision for broadband development and use and providing assistance to its communities. To review the findings and action items for CNHRPC and municipalities, please see the last section of the Plan starting on page 38.

OVERVIEW OF BROADBAND PLANNING IN CENTRAL NEW HAMPSHIRE

During the project's development, CNHRPC convened a broadband stakeholder group with representatives from around the region including residents, government, healthcare, education, and the private sector. Starting in 2012, representatives of the broadband stakeholder group met to identify and discuss the challenges and opportunities of broadband in the region, as well as to provide input for the Plan. Throughout the project's timeline, CNHRPC staff met with broadband professionals, including providers, to better understand the current environment of broadband and communications in the state and region. Three public forums were also held throughout the project timeline. The forums provided an opportunity to share information about the NHBMPP process, mapping efforts, as well as to gather input from the public on their broadband needs and concerns.

OUTREACH: WHAT WE HEARD

The broadband stakeholder group (BSG) met to discuss and provide perspective on current broadband availability, needs, challenges and concerns from around the region. Common trends discussed throughout the BSG meetings included the gap areas in the region where residents were either 'unserved' or 'underserved' by broadband; the growing "need for speed" for faster upload and download speeds especially for residents teleworking from home or running home businesses; and an interest in multiple providers serving rural areas to offer choices and competition in the market.

The BSG discussed how broadband has become as critically important as other utilities/infrastructure i.e. water, sewer, and electricity. From the municipalities' perspective there was interest in more information about Cable Franchise Agreements and other roles and responsibilities of the municipality related to broadband. In June 2014 CNHRPC hosted an open broadband forum with attorneys from DTC Lawyers to discuss Cable Franchise Agreements, legislation updates and strategies and responsibilities for the municipality to address broadband and wireless communications infrastructure.

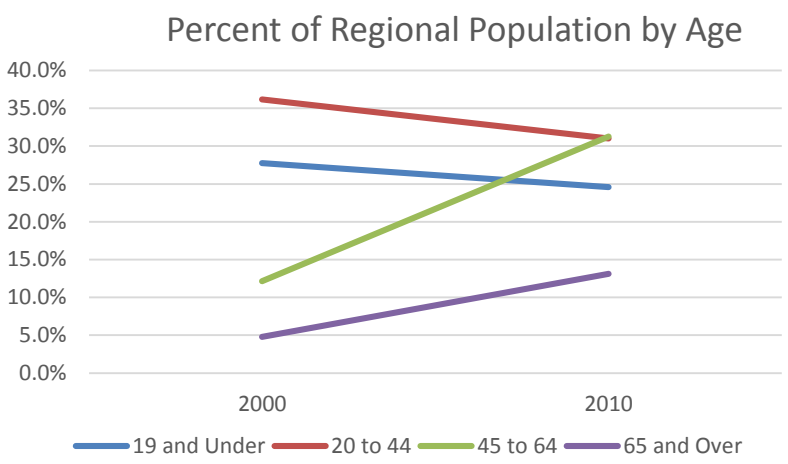
REGIONAL OVERVIEW: THE IMPACT OF DEMOGRAPHICS ON BROADBAND USE

Looking at current trends and forecasts of population as well as socio-economic changes can give some indication of broadband needs associated with these trends. With a 2013 estimated population of approximately 115,000 (www.nh.gov/oep/data-center/population-estimates.htm), the majority of the region's population resides in Merrimack County, with the exception of Deering and Hillsborough in Hillsborough County. Town populations in the region range from 1,388 in Salisbury to 7,099 in Pembroke. The city of Concord is located centrally in the region with a population of 42,614. As the capital of New Hampshire, Concord serves as an employment, economic and healthcare center in the region. Many of the communities in the region are rural, although some have traditional residential neighborhoods with higher densities. Concord's density is 666 persons per square mile and the remaining area of the region has an average of 122 persons per square mile.

Similar to the statewide trend, the population growth in the region has slowed in comparison to the faster population growth from 1980 to 2000. According to the Office of Energy and Planning's recent population projections (http://www.nh.gov/oep/data-center/population-projections.htm), this trend of slow growth is expected to continue in the region with the population projected to continue to grow, but at a rate of 3% over the next decade. While general population growth is one

obvious indicator of the potential for an increase in broadband usage, it is more critical to examine the actual profile of the population and what age groups will be increasing. Demographic trends such as rising median ages, fewer school-age children, and decreased in-migration have resulted in the lower projected increases.

Undoubtedly one of the more noticeable statistics is the aging of the population (see graph *Percent of Regional Population by Age*).



Source: 2000 and 2010 U.S. Census

CONNECTIONS: OLDER ADULTS AND BROADBAND

The Pew Research Center published a report, *Older Adults and Technology Use,* in the spring of 2014, focusing on how adults aged 65 and over use broadband and adapt to changing technology. These findings represent the results of a nation-wide random survey conducted over landline and cell-phones from July to September 2013.

Overall, it was found that two groups emerged: one younger, more highly educated and more affluent that has relatively substantial technology skills and a positive outlook towards the benefits of broadband use; and the second an older, less affluent group that often had challenges with health or disability and found to have a lower level of technology skills attained and less positive outlook towards broadband use.

General trends found in the survey include:

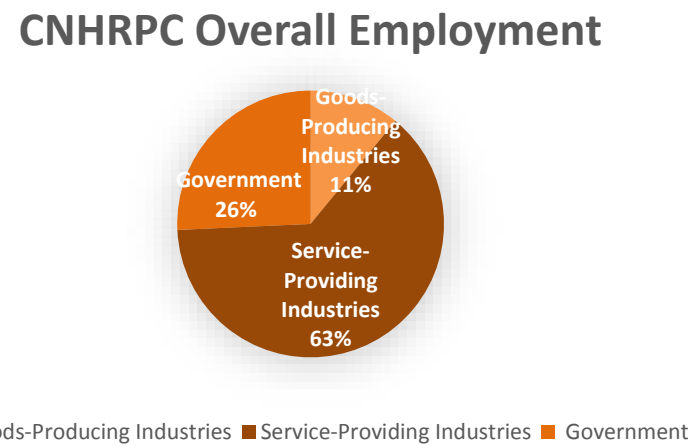
- Six in ten seniors now go online, and just under half use broadband connections at home.
- Younger, higher-income, and more highly educated seniors use Internet and broadband at rates approaching - or even exceeding - the general population; Internet use and broadband adoption each drop off dramatically around age 75.
- Once seniors join the online world, digital technology often becomes an integral part of their daily lives.
- Seniors differ from the general population in their device ownership habits. Seniors are less likely to use smartphones than the younger population but more apt to own a tablet or an e-book reader.
- 27% of older adults use social networking sites such as Facebook, but these users socialize more frequently with others compared with non-SNS (social network service) users.

The entire report can be found at:
http://www.pewinternet.org/files/2014/04/PIP_Seniors-and-Tech-Use_040314.pdf.

While an aging population is certainly a national trend, the northeast and New Hampshire in particular are aging more quickly**.** The median age in New Hampshire was 41.1 in 2010, the 4th highest median age in the country; the Central NH Region reflects the statewide median age with Bradford, Canterbury, Hopkinton and Sutton sharing the highest median age range of 45-50 years. What is interesting to note is that as this population ages, there are no indications that broadband use will decline as many of the aging Baby Boomers are well versed in the use of technology and expect broadband services to continue to be accessible to them. A recent Pew study points to the importance of broadband use for older adults and the need to continue to plan for increasing use of the technology, particularly for a population that expects adequate service.

Economic Development Trends and Broadband

Service-providing industries make up a majority (63%) of employment in the region. As the state capital, there are many federal and state government positions located in Concord, contributing 26% of overall employment. Goods-producing industries make up a smaller sector of overall employment (11%). The 2014 Central/Southern NH Comprehensive Economic Development Strategy (CEDS) completed for the Central NH Region identified the top three employment sectors in the region as government, health care, and retail. Going forward, in addition to manufacturing, four key industries for future economic development efforts in the region were identified by through an Industry Cluster Analysis in 2013; Business and Financial Services, Medical Services, Arts and Entertainment, and Information Technology. Keeping economic development thriving in the region has direct ties to ensuring that broadband infrastructure is adequate to support that growth.



Source: 2011 Economic & Labor Market Information Bureau, NH Employment Security, Covered Employment & Wages

The results of the Strength, Weaknesses, Opportunities and Threats (SWOT) completed for the CEDS identify what the region can potentially capitalize on and what challenges need to be addressed. There are multiple reasons for confidence in the Central NH Region's future. Regional strengths include the natural environment, a good location with highway access and high educational attainment as well as the opportunities that could be better exploited such as providing more development related information online, including the identification of available commercial sites. The recommendations found in both the industry cluster analysis and SWOT include projects related to broadband improvements, education and the development of a regional web portal that would assist in making online business development information more widely available throughout the region.

Regional weaknesses that were identified include a lack of consistent telecommunications coverage (both cellular and broadband Internet), the lack of close access to a research university, less access to public transit through the region, and fewer amenities that might be found in a more urbanized area.

Again, the SWOT compared the region with other similar regions in an effort to apply factors that impact business location decisions.

Another key economic indicator is the number of individuals in a community that are estimated to live below the poverty line. As estimated in 2012, Bow had the lowest poverty rate at 1.9%. In contrast, five communities had estimated poverty rates in excess of 10% in 2012: Deering (10.7%), Concord (10.9%), Boscawen (13.4%), Hillsborough (13.5%) and Pittsfield (18.4%). The Central NH Region is similar to the state's profile and this does point to those areas where lack of broadband access for financial reasons may exist and need to be addressed.

Individuals Below Poverty Level (2012)

Community	Individuals Below Poverty Level (2012)	Community	Individuals Below Poverty Level (2012)
Allentown	7.3%	Henniker	4.2%
Boscawen	13.4%	Hillsborough	13.5%
Bow	1.9%	Hopkinton	4.2%
Bradford	4.5%	Loudon	6.3%
Canterbury	4.3%	Pembroke	9.5%
Chichester	5.8%	Pittsfield	18.4%
Concord	10.9%	Salisbury	4.1%
Deering	10.7%	Sutton	4.0%
Dunbarton	7.4%	Warner	6.0%
Epsom	4.8%	Webster	6.3%

Source: New Hampshire's Economic and Labor Market Information Data System

The overall trends in the region present both challenges and opportunities. There are opportunities as a result of the changing demographics as the region positions itself to attract young professionals**.** Attracting a younger population will contribute to the well-being of the region by providing human capital that enhances the workforce and contributes to the social, intellectual, and economic life. Broadband is important to this age group and will only continue to rise. Economic development today is positioned to be of great interest to many municipalities and clarification of local government processes and improved broadband infrastructure are important factors. Many of these trends are not unique patterns to the region, but in light of the changing demographics and workforce, it is important the region's communities and businesses to come together to look at the impact of broadband infrastructure.

For further discussion on the trends and broadband needs, please see the sector analyses.

REGULATORY FRAMEWORK: STATE AND FEDERAL

TELECOMMUNICATIONS

Telecommunications law is shaped by a mix of federal, state and local laws and regulations, and a developing body of case law. The federal Telecommunications Act of 1996 (TCA) was the first major overhaul of communications law in over 60 years, amending the Communications Act of 1934.The goal of the law was to ensure that all communication businesses are allowed to compete with each other in any market and to promote such competition. Broadly, the Act preempts all state and local laws that would prohibit or have the effect of prohibiting an entity from providing telecommunications services. The TCA sets boundaries for local land use decisions on wireless tower applications and for management of public rights-of-way. The Act also creates separate regulatory tracks for cable and telecommunications – the telephone industry, not broadband per se, but there are implications for broadband since much of the infrastructure necessary for the provision of broadband overlaps with telecommunications, cable, and increasingly, wireless facilities.

FCC Determines Broadband is an Information Service Not Telecommunication

The Federal Communications Commission (FCC) regulates interstate and international communications by radio, television, wire, satellite and cable. As an independent U.S. government agency overseen by Congress, the FCC is the United States' primary, independent authority for communications law, regulation and technological innovation. In 2004, the FCC ruled that broadband service is classified as an information service under Title II of the TCA, not a telecommunication service, subject only to the jurisdiction of the FCC and preempting federal, state and local government from regulating the industry. There are currently ongoing discussions at the FCC and within the federal government on whether broadband should be regulated as a public utility (See below). If it were, Internet Service Providers (ISPs) would be subject to stricter and more comprehensive regulations. As long as ISPs are classified as

SHOULD BROADBAND BE REGULATED AS A PUBLIC UTILITY?

At the time of this document's preparation in late 2014, there is continuing debate on the question of whether broadband should be considered a public utility. Different interest groups, Internet service providers (ISPs), the FCC and government officials are weighing in with opinions on this issue. If broadband is reclassified as a public utility, ISPs would be subject to stricter and more comprehensive regulations. Many consumer advocacy groups, public entities and some private Internet companies believe that broadband should become a public utility as one way to help protect consumer rights and contain prices on Internet content and services. Others disagree and feel that ISPs should be regulated via antitrust and consumer protection laws only, arguing that a minimal regulatory framework fosters investment and innovation in the rapidly changing broadband market. This discussion has its roots in the concept of an open Internet, or "net neutrality," meaning that all information on the web should be treated equally. For example, with net-neutrality, Google or Amazon are treated the same way in terms of bandwidth used to reach Internet-connected services. Without net- neutrality, ISPs could slow down or speed up Internet connections based on preferences or payments from companies for faster speeds (more bandwidth). This ongoing debate will be played out at the federal level, and ultimately in the federal courts.

information service providers, not telecommunication service providers, there is no broad regulation of the industry.

Management of Public Rights-of-Way

The TCA sets the boundaries for state and local laws regarding telecommunications services, including management of public property, zoning and permitting. The Act preserves for communities all state and local laws that involve the management of local rights-of-way and laws that require telecommunications providers to pay taxes and compensation for use of local rights-of-way, as long as the laws are non-discriminatory, and compensation is fair, reasonable and competitively neutral. In New Hampshire, RSA 231:160 allows placement of poles and conduits in the public right-of-way only as permitted or licensed by the municipality, and not otherwise. However, if a local land use board approved locations of such facilities as part of the approval of a development, and if the locations of the facilities are provided to the municipality to record, they are deemed legally licensed (RSA 231:160-a). The statute also allows changes to any licenses, upon petition and hearing, whenever the "public good requires" (RSA 231:163).

The interpretation of the law regarding the extent of regulation and compensation allowable is evolving. Regarding taxation for use of the public right-of-way, RSA 72:23 requires that agreements with private entities to use public real estate include the requirement that the user pay property taxes. A line of cases, beginning with New England Telephone and Telegraph Co. v. City of Rochester, 144 NH 118 (1999) ("Rochester I"), has established that (1) this requirement for payment of property taxes when a private party uses public property covers pole and conduit licenses issued by municipalities, and (2) municipalities may universally amend those licenses to require payment of property taxes, as in the "public good." Following that case were two additional cases in which the telephone company claimed that its rights to equal protection under the law had been violated because it was singled out as the only user of the public rights-of-way to be taxed, Verizon New England, Inc. v. City of Rochester, 156 NH 263 (2004) ("Rochester II") and Verizon New England, Inc. v. City of Rochester, 156 NH 624 (2008) ("Rochester III").

In the past few years, the number of cases in which the telephone company, now FairPoint, has challenged municipal taxation for its use of the public rights-of-way, has increased. First, the City of Concord and FairPoint have a long-running case covering tax years 2000 to 2010, in which nearly all the users of the public rights of way were taxed along with the telephone company, and the City had rational reasons for not taxing the other users. These facts make this case the flip side of the "Rochester" line of cases, and in a recent decision, the NH Supreme Court ruled that, unless FairPoint could show that it was the subject of conscious, deliberate discrimination by the City, there was no violation of the law. Northern New England Telephone Operations, LLC, d/b/a FairPoint Communications – NNE v. City of Concord, NH (decided August 29, 2014). The case is now back in Merrimack County Superior Court for determination by the trial court of whether the City engaged in conscious intentional discrimination against FairPoint.

Second, FairPoint has filed approximately 450 lawsuits against municipalities, challenging their taxation of the company's use of the public right-of-way and of its poles and conduits, covering tax years 2011, 2012 and 2013. All of these case were sent to be handled by the same judge hearing the Concord case. They are all pending in Merrimack County Superior Court.

QUICK TIPS: RIGHTS-OF-WAY

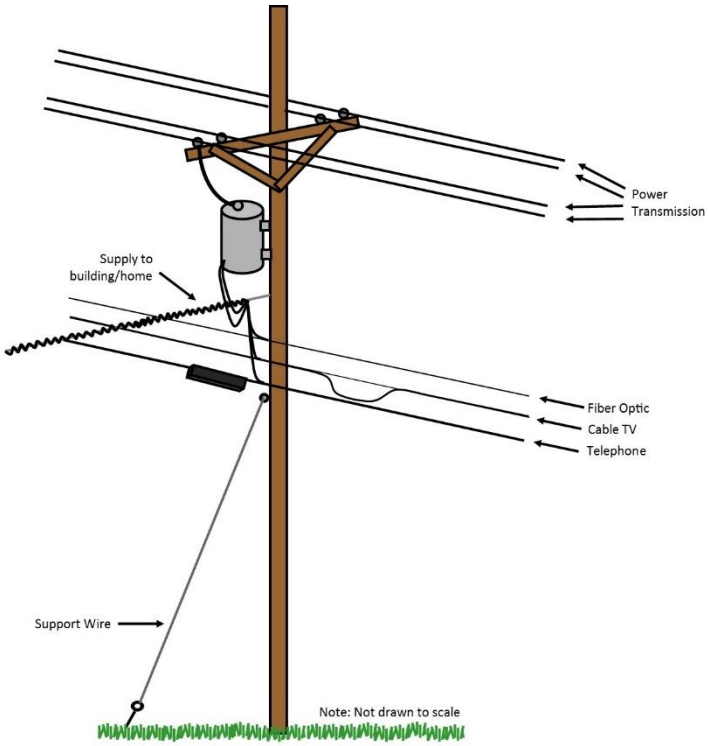
Municipalities manage public rights-of-way and are permitted to collect compensation from all companies for private use of a public asset. Action items for municipalities include:

- Inventory all existing licensing permits and occupants of rights-of-way, for the purposes for property tax calculations under RSA 72:23.
- Review all licenses and permits or agreements and consider globally amending them to impose property tax in "the public good" and obtain information on other users (attachers) to poles and conduits.
- Amend cable TV franchise agreements to require payment of tax.
- Consider requiring installation of municipal conduit for broadband within public rights of way, at same time that sewer and water infrastructure systems are placed, for future use.

An essential step for communities is to proactively determine and identify all users of the public rights-of-way, including all broadband providers. This information will be useful for knowing the extent of broadband services in the community, managing the public right-of-way for public safety, and fairly assessing costs and taxes for use of the public right-of-way. Municipalities should review all licenses, and other agreements such as cable TV franchises, for use of the public right-of-way to determine whether they should be amended to provide for payment of real and personal property taxes. If the decision is made to amend them in that manner, then an inventory of the users of the public rights-of-way will be required to properly assess such a tax. In order to accomplish this in an efficient manner, it is advised to use a universal amendment process for all licenses and agreements for use of the public rights-of-way, to add to licenses the requirement that users pay property taxes for use of the public rights of way. To assist the municipality with management of the right of way and for assessing taxes fairly, it is also recommended that the licensees that are pole and conduit owners also provide information annually to the municipality on all users of poles and conduit of the licensees.

Pole Attachments

Pole attachments are governed by Section 224 of the Communications Act of 1934 (47 U.S.C. 224), RSA 374:34-a (The New Hampshire Public Utilities Commission has jurisdiction to regulate pole attachments), and New Hampshire Code of Administrative Rules, PUC 1300. Originally enacted to address issues related to cable TV companies seeking access to utility poles, the laws and regulations on pole attachments have evolved to address an era in which there is competition for limited space on poles or in conduits, and an increasing number of competitive telephone companies and Internet service providers vie for that space. Pole owners understandably do not want to shoulder the cost of erecting bigger poles or laying additional conduit, so the costs must instead be paid by the new attachers. This can require existing attachers to move their



facilities, or to erect new poles, etc., with the costs associated with such work being absorbed by the attachers (i.e." make ready").

Those current laws and rules require:

i. A utility pole owner shall provide a cable television system or any telecommunications carrier with nondiscriminatory access to any pole, duct, conduit or right-of-way owned or controlled by it. (47 CFR Sec 1.1403(a); PUC 1303).

ii. PUC regulations control the rates, terms and conditions of attachments to poles and conduits. Private negotiations for such attachments occur in the context of a tariff based regulatory regime. NH Code of Administrative Rules, PUC 1300. New Hampshire PUC Rules follow the 2007 FCC formula for pole attachment fees.

Recently, sweeping FCC revisions to pole attachment rate formulae and regulations were ordered to ensure attachers to poles have fair and rationally priced access to utility poles.[1] At present, those revisions are not applicable to New Hampshire, since the PUC is developing its own body of decisions applying New Hampshire pole attachment rules in a variety of contexts.

Some competitive telephone companies and Internet service providers have pressed the NH PUC for more streamlined procedures and lower make-ready costs, but the interests of the pole owners in avoiding additional costs, and legitimate safety concerns, make the pole attachment process difficult to change.

QUICK TIPS: WIRELESS ANTENNAE AND FACILITIES

The TCA and RSA 12-K outlines the boundaries for local municipalities and land use boards when considering applications for personal wireless service facilities.

- Cell tower and antennae applications have different requirements than other applications seeking zoning board or planning board approvals.
- For co-location and modification applications for adding antennae that do not amount to 'substantial' modifications, the applications should only be reviewed for compliance with building permit requirements. The ZBA and Planning Board have no jurisdiction, and zoning does not apply.
- Create a specialty form for cell tower and antennae applications. The NH Office of Energy and Planning offers resources and sample forms available at: www.nh.gov/oep/planning/resources/wireless/introduction.htm
- The time for determining application completeness is 15 days for co-location and modification applications and 30 days for applications for new tower facilities or "substantial modifications."
- Time for acting on application: 45 days for co-location; 150 days for application of new tower or facility, or for a "substantial modification."
- Create a checklist to determine completeness of applications, keep track of deadlines.
- Appoint a "quarterback" or person to help the municipality and its boards stay on track with timelines for different types of applications.

[1] Implementation of Section 224 of the Act; A National Broadband Plan for Our Future, WC Docket No. 07-245, GN Docket No. 09-51, Report and Order and Order on Reconsideration, 26 FCC Rcd. 5240 (2011), aff'd sub nom. American Elec. Power Service Corp. v. FCC, 708 F.3d 183 (D.C. Cir. 2013), (cert. denied, Am. Elec. Power Serv. v. FCC, 2013 U.S. Lexis 6513 (U.S. Oct. 7, 2013).

Importantly, attachers with facilities already on poles may overlash new facilities on existing wire or cable, without any make-ready, delay or additional pole attachment costs. Companies well positioned for such an advantage are those that can overlash optical fiber on existing copper wire or cable, creating much greater capacity.

Zoning and Permitting of Wireless Telecommunications Facilities

Local zoning laws are preserved under the TCA for new wireless towers; however, new state and federal laws now in effect do not preserve such authority for new antennae on existing towers, base stations or other structures capable of supporting them.

The TCA provides local land use boards in New Hampshire and across the country with framework for their review of applications for personal wireless communications facilities ("PWCF" or commonly called "cell towers" or "wireless towers"). All decisions must be made within the context of the limitations and requirements of the federal law. The TCA sets the following general requirements for local land use boards when reviewing PWCF applications for new towers:

- Timeliness in rendering of decisions;
- Basing denials of applications on "substantial evidence" in a written record; and
- Not prohibiting the regulations of wireless antenna or towers due to environmental effects of radio frequency emissions.

The TCA also requires that boards: may not "unreasonably discriminate" among "providers of functionally equivalent services;" a board's decision cannot "prohibit or have the effect of prohibiting" the provisions of personal wireless services; and boards must act "within a reasonable period." The FCC issued an order in 2009 to add the so-called "shot clock", requiring that decisions must be made within 150 days on applications for construction of a new wireless tower.

In the last five years, there have been shifts in federal and state laws that affect how local land use boards review PWCF applications. The policy shift at the federal level was aimed at expediting deployment of broadband to all areas across the country. In 2009, as part of the American Recovery and Reinvestment Act (ARRA), Congress directed the FCC to develop a comprehensive National Broadband Plan to ensure every American has access to broadband services. In 2010, the FCC published its *Connecting America: National Broadband Plan*. As part of implementing the Plan and accelerating broadband infrastructure deployment, Executive Order 13616 in 2012 created a federal initiative to streamline procedures, requirements and policy across agencies to promote faster deployment of broadband infrastructure. A new federal law, described as part of the "Co-Location as of Right," requires local approval of eligible facilities requests, defined as:

- Co-locating new antennae on any existing tower or base station; and
- Modifications of an existing wireless tower or base station that are not "substantial."

New Hampshire has adopted the policy of facilitating the deployment of broadband infrastructure and goes further than the federal requirements. New Hampshire law allows placement of new wireless facilities on existing towers or mounts by building point only, including water and transmission towers as well as any existing building or structure which can support such installation. The New Hampshire statute regulating personal wireless service facilities, RSA 12-K, states that carriers wishing to build

PWSF in the state should consider commercially available alternatives to tall, cellular towers. The alternatives are:

- Lower antenna mounts that do not protrude far above surrounding trees' canopies;
- Disguised PWSF such as flagpoles, artificial tree poles, light poles, etc. that blends with the surrounding area;
- Camouflaged PWSFs mounted on existing structures and buildings;
- Custom designed PWSFs to minimize visual impact; and/or
- Other available technologies.

ZONING OF PERSONAL WIRELESS TELECOMMUNICATIONS SERVICES

Municipalities have the power to enact zoning regulating the placement of personal wireless service facilities within the boundaries of the municipality. It is recommended that municipalities should be proactive about this and carefully assess where and how these facilities should be sited. Once the municipality establishes favorable locations, the municipality should establish a hierarchy of siting values so that the siting most favored by the municipality has less stringent requirements for the wireless applicant to meet. Conversely, the siting which is least desirable from the municipality's perspective should require more conditions for the wireless applicant to meet.

Recent Changes: RSA 12-K and §6409 of Federal Spectrum Act (Middle Cass Tax Relief and Job Creation Act of 2012)

As discussed above, federal policy and law changes also led to changes at the state level, to facilitate deployment of broadband infrastructure quickly and efficiently. The New Hampshire law regarding wireless facilities, RSA 12-K: Deployment of Personal Wireless Service Facilities was amended in 2013 to incorporate and extend the federal changes required by section 6409 of the Spectrum Act. The following types of applications can be reviewed for compliance with building permit requirements, but are not subject to local land use review, zoning or land use requirements, including design or public hearing review:

- Co-Location applications, for placing new PWSFs on existing towers or mounts, including electrical transmission towers, water towers, existing buildings and "structures capable of structurally supporting the attachment of PWSF's in compliance with applicable codes."
- Modifications of existing equipment compounds or mounts that are not "substantial."

Under RSA 12-K, the definition of "substantial" is an increase of 10% of the vertical height of the tower or mount or 20 feet, whichever is greater. Municipalities have a forty-five day timeline to review the application, make a final decision, and communicate with the applicant. RSA 12-K law affirms and goes beyond the requirements of the FCC "shot clock" order, and, if the municipality does not act on the application within the 45 day timeframe, the application is deemed approved. If additional information is required, it must be requested within 15 days, and if so, the applicant has the right to correct the deficiencies and the timeline is extended. The decision on whether the application is exempt may be appealed to the ZBA.

It is important for local boards to move quickly on applications for co-location or modifications that are not considered substantial. Within 15 days the board must determine the completeness of the application, exemption status and if more information is needed from the applicant. The changes to RSA 12-K reflect a new balance between public policy promoting local planning and decision-making with public policy promoting accelerated access to broadband.

QUICK TIPS: CABLE FRANCHISE AGREEMENTS

Develop a negotiating agenda for renewal of Cable Franchise Agreements as part of comprehensive telecommunications planning:

- Inventory existing obligations of franchise agreement and determine compliance;
- Ascertain future cable related needs and interest of community;
- Negotiate renewal to meet needs of larger telecommunications planning goals; and
- Monitor cable operator's compliance with new franchise obligations.

Cable TV Services

A cable franchise is an essential element of the municipality's telecommunications infrastructure. Video, telephone and Internet services are all provided by cable TV companies.

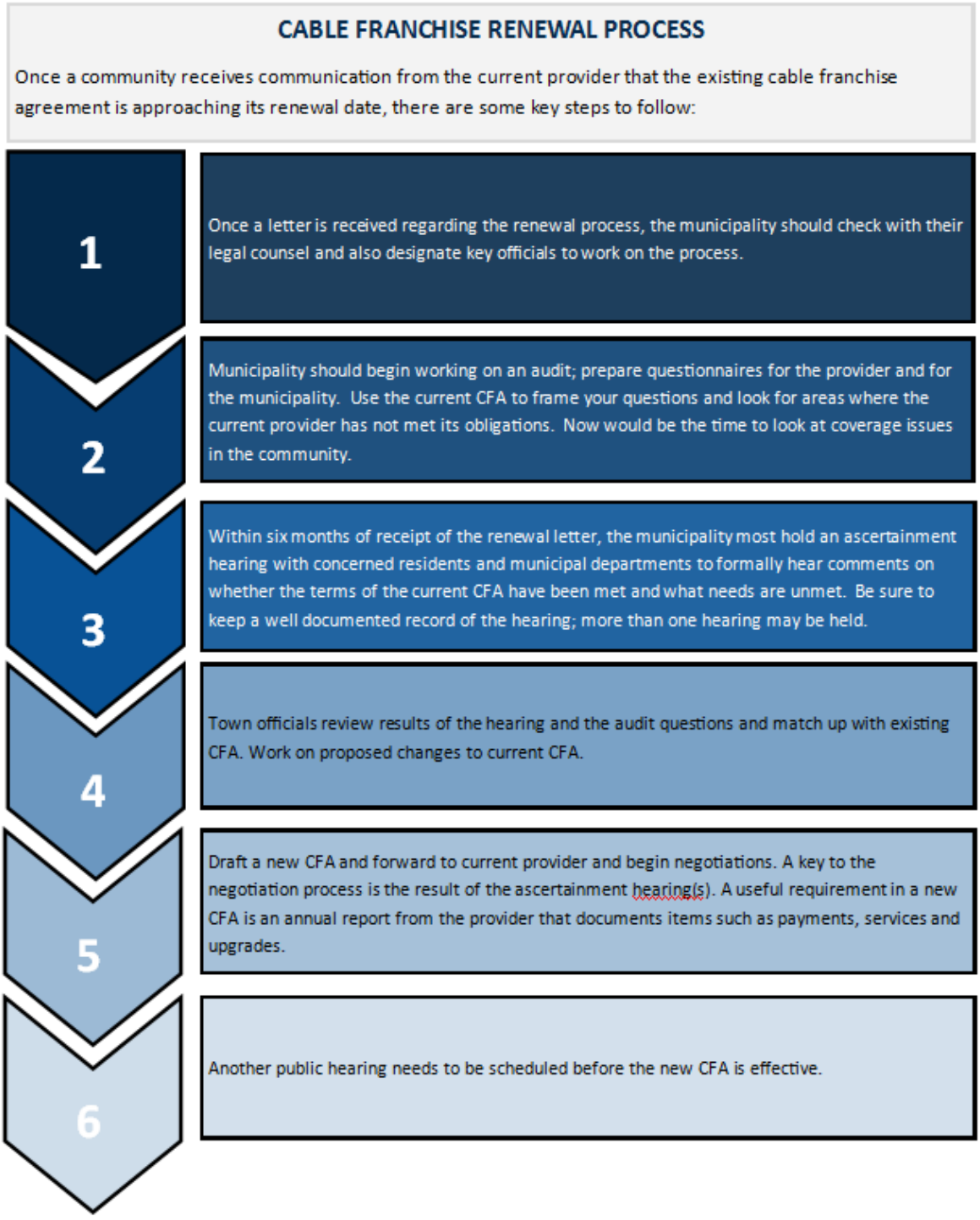
One of the strategic benefits of a cable franchise renewal can be to include extension of the cable TV system, and thus access to the Internet for businesses and residents within the municipality. The Federal Communications Commission (FCC) has ruled that internet services are not covered in the definition of "Cable Services." However, because of the business model of cable operators, the practical effect of enhancing the cable TV system's coverage in a municipality also increases the availability of internet services since they are delivered over the same facilities.

The cable franchise renewal process involves looking backwards at the cable TV operator's compliance with the specific terms of the current franchise agreement (Even if it has passed its expiration date, cable TV companies will continue to provide services pursuant to an expired franchise agreement, unless and until (1) the franchise is renewed, or (2) the municipality denies renewal of the franchise, an extremely difficult thing to do which requires building a record for denial for review by a federal court successfully). The renewal process also involves looking forward to identify the future cable TV (not Internet) needs and interests of the community. Both tasks must be done comprehensively to provide communities with the most available leverage in their negotiations with cable companies. By way of example, if the cable operator is not in compliance with a specific element of the franchise agreement, it may be willing to provide benefits to the municipality, without cost, to resolve the non-compliance. As another example, if there is strong community support for extension of the cable system to reach new areas, the cable company may be willing to absorb some of the cost.

The renewal of a cable TV franchise should be based on:

- Cable operator substantially complying with the terms of the existing franchise;
- Quality of the operator's service, including signal quality, response to consumer complaints, billing practices;
- The operator has the financial, legal and technical ability to provide the services, facilities and equipment as set forth in the operator's proposal for renewal;

- The operator's proposal is reasonable to meet the future cable related community needs and interests, taking into account the cost of meeting those needs and interests;
- Length of agreement should relate to the satisfaction with the proposal, for example negotiate a shorter length agreement if municipality is not satisfied with terms proposed by the cable company.



RECENT LEGISLATIVE ACTIVITY

Bonding for Broadband Infrastructure / HB286 (2014 legislative session)

Municipal bonds are a typical funding source for municipalities to finance capital projects, such as building schools, sewer systems and other large infrastructure projects. Currently in New Hampshire, the majority of broadband infrastructure is financed by private sector broadband service providers. There are gap areas across the state and within the Central NH Region where there is no service or inadequate coverage and commercial broadband providers are unable or unwilling to invest. One of the potential options for providing better broadband coverage would allow a municipality to bond for broadband infrastructure projects to fill those gaps.

The New Hampshire legislature considered a bill that would broaden the ability of municipalities to bond for broadband infrastructure projects. House Bill 286 (HB286) amends language that allows municipalities to bond for broadband projects for any areas that are without 'adequate' coverage, removing the more restrictive language that currently only allows bonding for broadband infrastructure under strict criteria which only apply to a fraction of the state. The Bill states that governments are only allowed to build the infrastructure or equipment, such as cables, needed to deliver broadband. Municipalities cannot provide broadband service. The bill has both supporters and opponents. After the House passed the bill, the Senate sent the bill to interim study at its last action on May 15, 2014. The bill may be re-introduced in the next session.[2]

Assessment Districts / HB1458 (2014 legislative session)

- HB 1458 would allow a municipality to establish a special assessment district and add on a special tax for public facilities and services that enhance economic development and retain economic viability.
- The Bill would allow municipalities to levy and collect special assessments from property to recover the cost of providing public facilities that benefit the property upon which they would be imposed.
- Would allow a governing body to draw up the district, though a majority from the designated area would still have to approve any spending.
- The House sent this bill to interim study, but it may be reintroduced in the next session.

Competitive Cable TV Franchises/SB 344 (2014 legislative session)

SB 344 would have ended a requirement in RSA 53-C:3,b that currently ensures that competitive cable TV franchises be no "more favorable or less burdensome" than the franchise agreement of an incumbent cable operator in the same municipality. Existing law protect incumbent cable operators from competition from a new entrant seeking market share. The practical effect of the legislation would be to enhance competition, which could have positive impacts for consumers.

[2] Community Broadband Networks. HB 286 Refined for New Hampshire Legislature *Thu, November 14, 2013 | Posted by lgonzalez* http://www.muninetworks.org/content/hb-286-refined-new-hampshire-legislature

SB 344 was opposed by incumbent cable TV. It was sent to interim study in March, 2014, effectively killing the bill for the last session, but it may be re-introduced in the new session.

REGULATORY FRAMEWORK OVERVIEW

In summary, municipalities should have a proactive and practical agenda for addressing their telecommunications infrastructure needs within the regulatory framework. This involves an iterative process of assessing needs, planning, executing on plans and reviewing implementation as part of a new round of assessing, planning and acting. It will benefit communities to be proactive, to create master plans and zoning ordinances that put broadband infrastructure at the center of municipal goals and decisions. Zoning ordinances should encourage deployment of broadband strategically to meet the needs of the community. Planning Board regulations should encourage additional capacity, through required conduit placements for future use. Cable TV franchises should maximize broadband benefits for communities.

BROADBAND AVAILABILITY IN CENTRAL NEW HAMPSHIRE REGION

While not the case in every instance, the typical set of circumstances that signify the inability to access adequate broadband services are based upon location, specifically the rural nature of a community, and the broadband service provider in a given area. Many Central NH Region communities have access to Comcast Cable Internet and/or DSL services provided by a variety of companies, notably FairPoint Communications and TDS Telecom. At the time of finalizing this document in late 2014, areas of several communities in the region will have access to fiber to the home (FTTH) services. At the same time, however many areas in the region do not have access to wired broadband, and must rely on mobile broadband services that are more expensive and generally not as reliable.

Refer to **Appendix D** for the full set of regional broadband maps developed for this project as well as a description of the broadband mapping methodology. Mapping broadband availability is just one tool for analyzing broadband in the region. Broadband data is mapped by the US Census block level, which provides a fairly high-resolution picture of broadband availability but it is limited at the same time. Although this is the best level of data available, the drawback is that aggregating data to the census block may over-represent coverage and quality of coverage especially in large area census blocks, which are common in more rural areas. If any single address within a census block as broadband service at a higher speed, the entire block is showed as being covered at that speed. A select number of maps will be referenced throughout this section, including broadband availability, advertised speeds, degree of competition, community anchor institutions, as well as results from the online speed test.

CURRENT BROADBAND AVAILABILITY

The Central NH Region is similar to other areas in the United States with a mix of rural and urbanized areas, a land use pattern that directly affects the availability of adequate broadband coverage. In more populated, urban or suburban communities in the region, including Concord, users generally have adequate coverage and commonly have choices a number of providers. As shown on Map 1 *Degree of Competition for Broadband Availabil*ity located in **Appendix D**, the central, eastern and southern portions of Concord and northern parts of Bow have upwards of ten broadband providers, and areas of Hopkinton, Bow, Pembroke, Epsom, Chichester, and Loudon have reported six to ten providers available. Map 2, *Broadband Availability as Reported through the NHBMPP Online Speed Test* also located in **Appendix D** demonstrates provider locations based on those who took the NHBMPP speed test. Even though the number of providers is on a smaller scale, the largest number of providers, shown by the largest number of different colored dots in one area, is shown to be in the Concord and the northern section of Bow. A recent development in the region has been the deployment by TDS Telecom of fiber to the premises in communities where it already has a franchise for telephone service from the state. Nine of these communities are in the Central NH region: Boscawen, Chichester, Deering, Henniker, Hillsborough, Hopkinton, Loudon, Salisbury and Sutton.

In other areas of the region where coverage is adequate, there are only one or a few choices in the number of broadband providers. This includes more rural areas, especially in the western half of the region. Map 1 displays these areas being in Dunbarton, Henniker, Deering, Hillsborough, Bradford, Warner, Sutton, Webster, Salisbury, Boscawen, Canterbury, Pittsfield, and Allenstown, where an estimated range of one to five choices in service providers is available. Map 2 shows typically one or two providers in these communities, with the western part of the region mainly having broadband access through TDS Telecom, and small areas of coverage by Comcast. Canterbury, Pembroke, Allenstown, and

Chichester show access through Comcast and Comcast Business, while Pittsfield and Epsom shows MetroCast and Fairpoint as their main providers.

While these two common variations show adequate coverage, there are many areas throughout the region that are underserved or unserved, often referred to as gap areas. Gap areas are found in areas throughout the entire region and can be summarized as follows:

- Rural communities or areas that lack Cable Internet and DSL services
- Rural communities or areas that lack Cable service with irregular coverage by DSL
- Rural neighborhoods immediately adjacent to areas served by existing Cable or DSL service providers that would require an extension of infrastructure not supported by existing densities

CURRENT BROADBAND SPEED

Broadband is measured in terms of upload and download speed which is the amount of information transmitted per second. The speed of any user's broadband can be limiting to the users final goal if the broadband speed is not adequate.

Based on results of NHBMPP's online speed test summarized in Map 3, survey participants from the Concord area were shown to have the highest speeds, generally in excess of 6 Mbps download, while much of the western and northwestern portion of the region recorded slower speeds within the 1-3 Mbps download range. The highest download speeds in the region were found to be above 1 Gbps largely due to recent expansion of fiber and improved cable service in some areas. These speeds are available in at least part of nearly half of the Central NH Region's municipalities. An exception is the southwestern communities, where maximum speeds are around 100 Mbps or less in most areas. Advertised speeds are typically higher than the actual delivered speeds, which can vary. Advertised speeds can be seen in Map 4, also located in **Appendix D**.

Typical uses that require broadband at high speeds include:

- Sending/receiving large files and small to medium-sized databases
- HD quality, codec-based, large frame videoconferencing; multiple (bridged) sites/users
- Remote synchronous education, professional development, workshops, etc., facilitated simultaneously at multiple classrooms and/or other locations
- Telehealth/telemedicine applications
- High speed end to end network and business to business applications
- Telemetry-based applications (rely critically on the ability of broadband to continuously monitor and multiplex data, i.e. remote patient monitoring, sensing systems, etc.)

Broadband speed and the associated provider are compared in the results of the NHBMPP online speed test shown on Maps 2 and 3. It can been seen that the majority of the highest speeds were submitted through users of Comcast cable in the greater Concord area with speeds ranging from six to greater than eighteen Mbps. Service provided by TDS Telecom provided the majority of second highest speeds of less than one to six Mbps in the western half of the region. Customers of Fairpoint submitted the online speed test from the eastern half of the region, reporting speeds of one to three Mpbs while the few submissions from Metrocast and Verizon Wireless varied. For additional information on speed tests submission location, providers, and speed refer to Map 2 and Map 3 in **Appendix D**.

LEVEL OF BROADBAND SERVICE

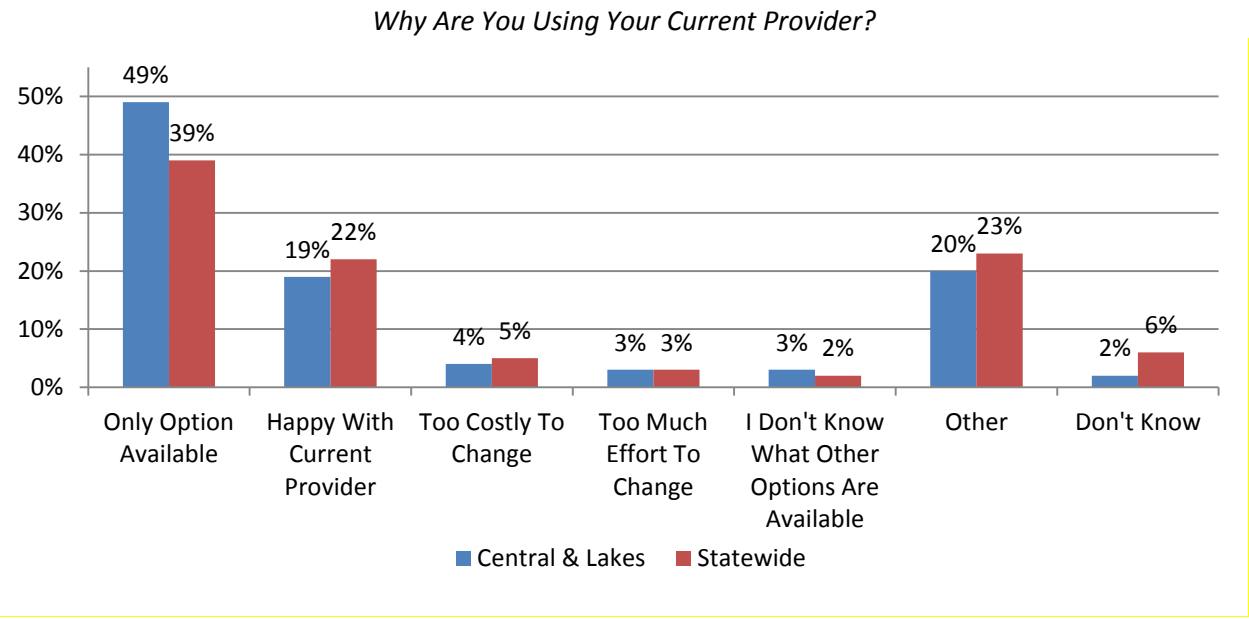
Level of service of an area can signify if the area is receiving adequate broadband coverage at adequate speeds, as summarized in Map 5 *Level of Service for Broadband Intensive Applications and Uses*. As shown in the map, the majority of Concord, Bow, Pembroke, Allenstown, and Hillsborough are described as adequately served, even though all of these communities have varying portions of underserved, unpopulated, or served with reported gaps areas. A large portion of the area covering Bradford, Sutton, Warner, Webster, and Salisbury are reported underserved, along with larger portions of Dunbarton, Epsom, and Pittsfield. Finally, Sutton, Salisbury, Loudon, Allenstown, and a small portion of Hillsborough and Henniker report being unserved.

Additionally, Map 6 *Broadband Availability for Uses That Require High Speed,* located in **Appendix D**, shows which areas within the region have broadband available that allows residents and businesses to operate tasks that require high speeds. All twenty communities within the region have areas of unavailable service, however, Bradford, Warner, Sutton, Salisbury, Webster, Pittsfield, and Dunbarton contain the largest patches of unavailable service. Concord, and the surrounding communities have the most coverage, with high speed availability depleting closer to the edges of the region.

UNH BROADBAND SURVEY

In a 2013 survey conducted by the University of New Hampshire's Survey Center, 93% of residents in the region have Internet access in their home. The telephone survey was conducted as part of the New Hampshire Broadband Mapping and Planning Program (NHBMPP) for the nine Regional Planning Commissions to gather information regarding broadband. For purposes of gaining statistical significance, the Central and Lakes Region Planning Commission were combined (referred to as the Central and Lakes Region).

While responses from residents of the Central and Lakes Region were largely similar to those of statewide residents, there are a few areas of difference to note. More Central and Lakes Region residents live in rural locations away from the town center compared to the state. Nearly 50% of the Central and Lakes Region residents with Internet at home reported that their current Internet provider is the only option available to them, indicating a lack of competitive options. This is consistent with data provided in Map 1 *Degree of Competition for Broadband Availabil*ity, which shows the more rural areas of the region having only one or a few options for broadband, especially in the western communities. Statewide, about 40% are in a similar situation where their current provider is the only broadband option available where they live. Although the region has only 7% without Internet access at home, 15% of this group report a lack of availability as the reason for not having Internet at home. This rate is considerably higher than the five percent statewide who gave a similar response, indicating that there are gaps in broadband service in the region.



Also concluded by the survey, the majority of residents with Internet are served by fixed wire Internet (85%), with 63% using Cable connection, followed by DSL (20%), and fiber (1%). A smaller percentage (12%) of the region's residents use wireless services including fixed wireless, cellular, and satellite.

Ninety-one percent of the Central and Lakes Region residents stated that their Internet connection was adequate for their uses, on par with the statewide response (92%). When describing what tasks are primarily performed online and have adequate connections to do so, 89% primarily use the Internet to check e-mail, 72% shop online, 57% watch online videos, and 22% use VPN (virtual private network). Meanwhile, 6% of e-mail checkers, 4% of online shoppers, 7% of video watchers, and 3% of people using VPN report the connection is slow.

Finally, the survey asked how much more (if any) residents would be willing to pay for faster internet speeds. Eighty-eight percent would not be willing to pay any more for faster speeds, while nine percent stated only twenty-five percent more per month. On a statewide level, only 85% would not pay more for faster speeds, while 11% would pay an additional twenty-five percent per month.

When considering the survey data with the broadband maps, the survey data appears to tell a more optimistic story about broadband coverage and adequate use than the maps. Map 6, *Broadband Availability for Uses That Require High Speed,* illustrates that more than 50% of the region has adequate connection for high speed uses, but does not appear to reflect the 91% response collected by the survey. Similarly, Map 5, *Level of Service for Broadband Intensive Applications and Uses,* highlights more gap areas of underserved and unserved broadband connections than the survey data appears to reflect.

The data collection and the mapping and survey tools for broadband availability provide a lens to view the broadband landscape in the region, but neither are capable of providing the full extent of the story of broadband. For more information on broadband mapping methodology, refer to **Appendix D**. The following section, Demand for Broadband in the Central NH Region, adds to the picture of broadband availability by reviewing broadband use, initiatives and challenges by the various sectors in the region.

DEMAND FOR BROADBAND IN CENTRAL NEW HAMPSHIRE REGION

As Internet use and on-line applications continue to be integral to daily life, work, and communications, fast, reliable, high-capacity broadband is in demand across the region. This section reviews the current use of broadband and highlights initiatives, as well as outlines some of the challenges and future needs facing the education, healthcare, local government, public safety, economic development and residential sectors in the region.

To better understand broadband demands and challenges in the various sectors, CNHRPC met with the Broadband Stakeholder Group, held public forums, conducted interviews and launched an online sector-based survey. Input from residents, town officials, business owners as well as education, public safety, and health stakeholders informed this section. Case studies highlight initiatives and trends that illustrate the impact of online technology and the demand by different sectors.

Many of the current uses of broadband, and challenges, are shared across many different sectors. While there are differences unique to individual sectors, broadband is widely depended upon for communications, including the rising use of social media, education and training, data storage, transactions, and more. Many of the challenges and future needs for improved broadband are similar across all sectors, including limited resources, better coverage in rural areas, higher bandwidth and more providers, as well as information and trainings about integrating and improving Internet technologies. This section reviews broadband use and highlights initiatives in each sector, followed by a discussion of shared challenges and future needs that are used to build the strategic actions identified in this Plan. For a continued review of broadband applications within the different sectors refer to **Appendix C**.

BROADBAND CONNECTIONS: COMMUNICATION AND SOCIAL MEDIA

Social media, like Facebook and YouTube, are applications that facilitate social interaction over web and mobile technology. The highly personalized, easy, flexible nature of social network applications makes them some of the most-used online tool and one of the main drivers of broadband demand. It would be remiss not to note the prevalence of social media and broadband use and to think about the powerful force of how it shapes the way we communicate in personal and professional spheres, as well as the resulting impact on news, marketing, and the economy.

- Facebook has more than 845 million active users every month around the world.
- About 80% of Facebook users are located outside the United States and Canada.
- Over 700 billion minutes a month are spent on Facebook.
- Over 425 million people access Facebook via their mobile phone.
- 48% of young people say they now get their news through Facebook.
- The average user is connected to 80 community pages, groups and events.
- In just 20 minutes on Facebook over 1 million links are shared, 2 million friend requests accepted and almost 3 million messages are sent.

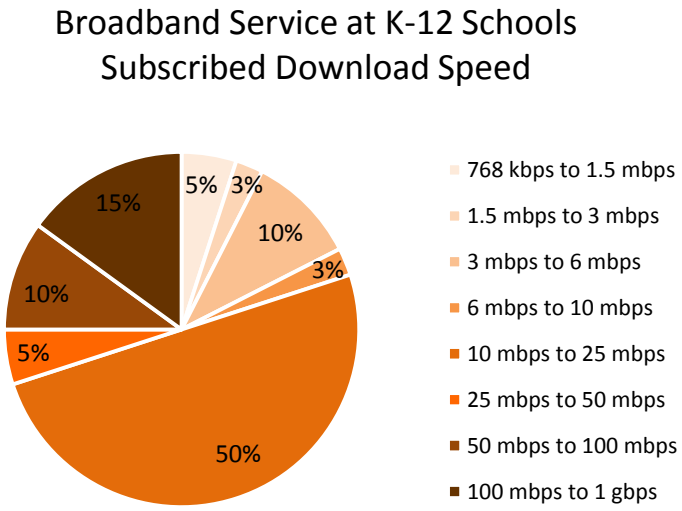
Source: http://broadbandtoolkit.org/1.4

BROADBAND USE AND INITIATIVES

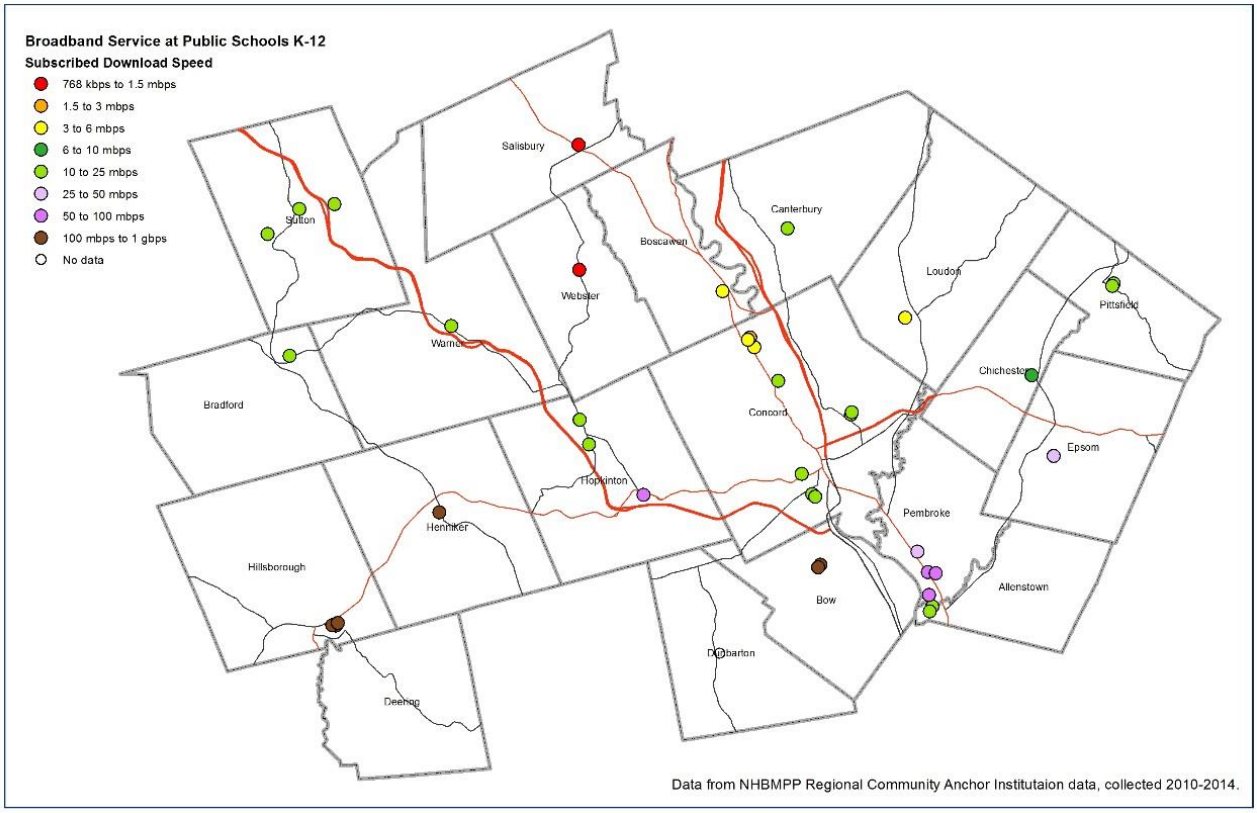
Education

The use of broadband in the education field continues to enhance access to and improve the quality of education at all levels in New Hampshire. The availability of a wide range of internet based resources such as distance learning programs, online learning modules, and digital textbooks allow students to engage in multimedia lessons, take virtual field trips, and communicate with classrooms in other parts of the world. Teachers are incorporating internet-based resources in and out of the classroom so that students receive relevant education and learn the technological skills required in the 21st century. Nationally, teachers are employing the method of 'flipping the classroom' where students first gain exposure to new material outside of class, usually via online activities or videos, and then class time is used to do the work of analyzing and assimilating information.

As teaching and broadband technology become increasingly intertwined, school facilities and students at home face an increasing need for high-capacity, fast internet technology. For New Hampshire to continue having a well-trained, well-educated labor force to meet the demands of a changing economy and business environment, residents need fast, high-capacity broadband at home to access educational opportunities remotely. Online education programs offer flexibility which allows adult learners to continue working while pursuing additional education for the next job opportunity or retraining in a new field. For school facilities, the State Educational Technology Directors Association recommends that K-12 schools have access to broadband speeds of 100 megabits per second for every 1,000 students and staff by the year 2014 and 1 gigabyte per second by 2017.[3] CNHRPC's inventory of schools as part of the Community Anchor Institutions (CAIs) data set collected between 2010 and 2014 shows a varying degree of broadband speeds at the region's K-12 public schools. Over half of the public K-12 schools in the region have a 10 Mbps to 25 Mbps download speed, but many of the schools have connection speeds that are lower.



[3] C. Fox, J. Walters, G. Fletcher and D. Levin, "The Broadband Imperative: Recommendations to Address K-12 Education Infrastructure Needs," *State Education Directors Technology Association*, 2012, http://www.setda.org/web/guest/broadbandimperative. (accessed July 17, 2013).



Schools are incorporating and planning for improved technology as educators and administrators transition to web-based content and resources, including required online statewide assessment tests. New Hampshire, along with 20 other states, will be implementing the Smarter Balanced assessment system statewide in Spring 2015. The student assessment test is completely online and uses computer adaptive testing which adjusts the difficultly of questions based on individual student responses.

TECHNOLOGY READINESS IN SCHOOLS

In order to implement the statewide Smarter Balanced assessment system in the 2014-15 school year, New Hampshire schools needed to assess the current technology capacity and prepare for necessary improvements. The Technology Readiness Tool was developed to support districts as they transition to next-generation assessments to be administered in Spring 2015. All school districts in New Hampshire were requested to use the tool to assess technology readiness in 2014. The data collected and reports provided by the tools are used in developing district technology plans. The New Hampshire Technology Readiness tool is available on the NH Department of Education, Office of Educational Technology website at: www.nheon.org/oet/readiness/index.htm. New Hampshire is part of the Smarter Balanced Assessment Consortium (SBAC). For more information on Smarter Balanced visit the NH Department of Education's website: www.education.nh.gov.

Healthcare

With increasing and changing health needs, ranging from accessing health insurance online through the Affordable Care Act, managing chronic illnesses, meeting the needs of an aging population to addressing the shortage of specialists in rural locations, broadband Internet plays an important role in how these issues are addressed. Many emerging technologies and approaches to health care are dependent on broadband connections to incorporate the latest health technologies that benefit patients, health providers, and health industry businesses, leading to cost-saving efficiencies, improved healthcare and better outcomes. As a growing proportion of the population ages and residents choose to age in place in New Hampshire, broadband extends the quality and reach of medical care to residents especially in the smaller, more rural communities in the region.

Fiber optic broadband is available to the large medical providers in the City of Concord where the concentration of medical services for the region is located. For these facilities, the high-capacity broadband supports electronic health records management, telehealth[4] applications and video conferencing and other emerging technologies. Depending on location, some of the satellite healthcare facilities in the more rural communities of the region do not have the broadband infrastructure available to them that is needed to support online applications. In an example told by a healthcare administrator in the region, a specialized medical interpreter has to travel from Boston to assist with patient services at one of the satellite health centers. With a higher capacity broadband infrastructure available to the facility, the health center could provide the required services via live video conferencing reducing costs and increasing flexibility. The practice could additionally provide other specialized health services to patients who might not otherwise have access.

CONNECTIONS: HEALTHCARE AND BROADBAND

Concord Hospital and the Concord Hospital Medical Group (CHMG) providers use information technology, such as electronic medical records system, in their regular practice to improve patient treatment and management of care. Electronic medical records systems enable providers to compile more comprehensive patient records and to collaborate in patient care by accessing treatment information and test results from different locations. A new electronic medication reconciliation system is also used to keep medication lists accurate and prevent potentially harmful interactions between medicines and dose. Patients have access to a secure online portal, Patient Connect, which allows patients to keep health information updated and correspond with providers, as well as receive inpatient discharge instructions, medications, and medical test results. Many of the improvements were funded in part by 2009 ARRA funds that included a program that incentivized healthcare providers to make more use of health information technology. Concord Hospital and CHMG successfully met requirements and achieved funding for continued improvements of patient care. For more information visit: www.concordhospital.org.

[4] Telehealth, the broader term incorporating telemedicine, is the transfer of electronic medical data (images, sounds, live video, and patient records) from one location to another.

Local Government

As municipal governments increasingly rely on broadband for daily functions and resident services, a reliable, adequate broadband connection is important for local government to meet the needs of residents and the municipality. Municipalities in the region host websites providing information such as event calendars, public notices, meeting minutes, applications, forms, ordinances and regulations. There are online training opportunities for municipal employees. Demand for online services and information from residents, potential homebuyers and businesses is increasing with the use of online billing and permitting, access to online property inquiries and assessment data, online meeting information and electronic emergency notification systems. Broadband connectivity provides the capacity to more efficiently and cost-effectively deliver information and services while also opening up possibilities for new services and facilitating more robust public participation.

Citizens have come to desire, and expect, a certain level of online interactivity with government and community support organizations. People conduct their work and everyday lives online, getting information and updates from local and international websites, and more and more through social media. Local governments will benefit from continuing to use and expand online applications, websites, surveys, video streaming for communicating with residents and others looking for municipal information. Using new avenues to communicate, including social media, offers more opportunity for a larger percentage of the population to get informed and participate in community decision-making processes. The challenge facing local government is an increasing demand for services within an environment of limited resources and tight budgets.

As part of the online sector survey, municipal departments from around the region self-reported broadband connections and speeds using the NHBMPP speed test. Reported connection speeds range from DSL technology of 3 Mbps - <6 Mpbs download to Cable connections of 10 Mbps - <25 Mbps download. About half of the municipal stakeholders reported that their broadband connection adequately served their current needs, while others, even those with higher speeds, are fully utilizing their current broadband capacity and have a growing demand for more bandwidth. While new applications allowing for improved public sector and community support organization interaction and transparency will continually surface, the need to perpetually maintain and improve broadband infrastructure will remain a constant.

Connections in the Central New Hampshire Region

Municipal Department	Connection	Download Speed	Upload Speed
Town of Sutton	DSL	768 Kbps - <1.5 Mbps	768 Kbps - <1.5 Mbps
Town of Salisbury	DSL	1.5Mbps - <3 Mbps	1.5 Mbps - <3 Mbps
Town of Webster	DSL	1.5 Mbps - <3 Mbps	1.5 Mbps - <3 Mbps
Town of Boscawen	DSL	3 Mbps - <6 Mbps	768 Kbps - <1.5 Mbps
Town of Henniker	DSL	3 Mbps - <6 Mbps	768 Kbps - <1.5 Mbps
Bradford - Brown Memorial Library	DSL	3 Mbps - <6 Mbps	768 Kbps - <1.5 Mbps
Henniker - Parks and Rec Dept.	DSL	3 Mbps - <6 Mbps	3 Mbps - <6 Mbps
Town of Epsom	Cable	6 Mbps - <10 Mbps	768 Kbps - <1.5 Mbps
Town of Pittsfield	Cable	6 Mbps - <10 Mbps	1.5 Mbps - <3 Mbps
Town of Allenstown	Cable	6 Mbps - <10 Mbps	6 Mbps - 10 Mbps
Boscawen Public Library	Cable	10 Mbps - <25 Mbps	3 Mbps - <6 Mbps

Connections in the Central New Hampshire Region (Cont.)

Municipal Department	Connection	Download Speed	Upload Speed
Bow - Baker Free Library	Cable	10 Mbps - <25 Mbps	3 Mbps - <6 Mbps
Town of Bow	Cable	10 Mbps - <25 Mbps	10 Mbps - <25 Mbps
City of Concord	Cable	25 Mbps - 100 Mbps	10 Mbps - <25 Mbps

Source: Self-Reported Local Government Department Survey Responses to CNHRPC online Broadband Sector Survey using NHBMPP Speed Test, Nov. – Dec. 2013

Public Safety

Important functions for public safety revolve around the ability to communicate with the public, as well as with other responders during an emergency. Mobile command post operation, online emergency notification systems, real time data sharing and remote access to databases needed in the field such as criminal history and medical records, are important broadband functions to public safety stakeholders in the region. For example, some schools in New Hampshire are equipped with security cameras enabling police, in route to a school emergency, to view video feeds in real time, to arrive at the scene with information on the location and status of the emergency situation.

Real time data sharing via social media and crowdsourcing information is becoming more prevalent in the public safety field. Communicating via social media, on Facebook or Twitter or other social media platforms, is where many people go for information and updates. During disasters or emergency situations, such as the case during Hurricane Sandy, municipalities and public safety departments can reach residents with real time updates. There is a lesser-known Twitter feature called Fast Follow, which enables SMS (text) notifications of the Twitter feed so that people can receive information quickly. This further broadens the reach of the news or updates that municipalities or departments want to disseminate and also helps reach those who are less inclined to use Twitter online.

BROADBAND CONNECTIONS: PUBLIC SAFETY AND CROWDSOURCING

Crowdsourcing is a type of web collaboration referring to the outsourcing of tasks to a large, undefined group or community, the "crowd" through an open call for assistance, such as via Twitter, Facebook or a dedicated webpage. Following the 2010 earthquake in Haiti, the Crisis Map of Haiti used crowdsourcing to coordinate relief efforts on the island. Those in need could submit incident reports via the organization's website, phone, SMS, email, Facebook, Twitter, etc. and thus request aid or report a missing person. After being reviewed by volunteers, the reports were mapped with Global Positioning System (GPS) coordinates in near real-time on a map also showing shelter sites and hospitals. These tools helped speed search-and-rescue efforts and provide vital supplies to those most needing them. The events in Haiti provide a learning opportunity for how to respond and manage future disasters, both natural and man-made, as well as demonstrating a practical application of social media platforms and web-based technologies.
Source: http://broadbandtoolkit.org/6

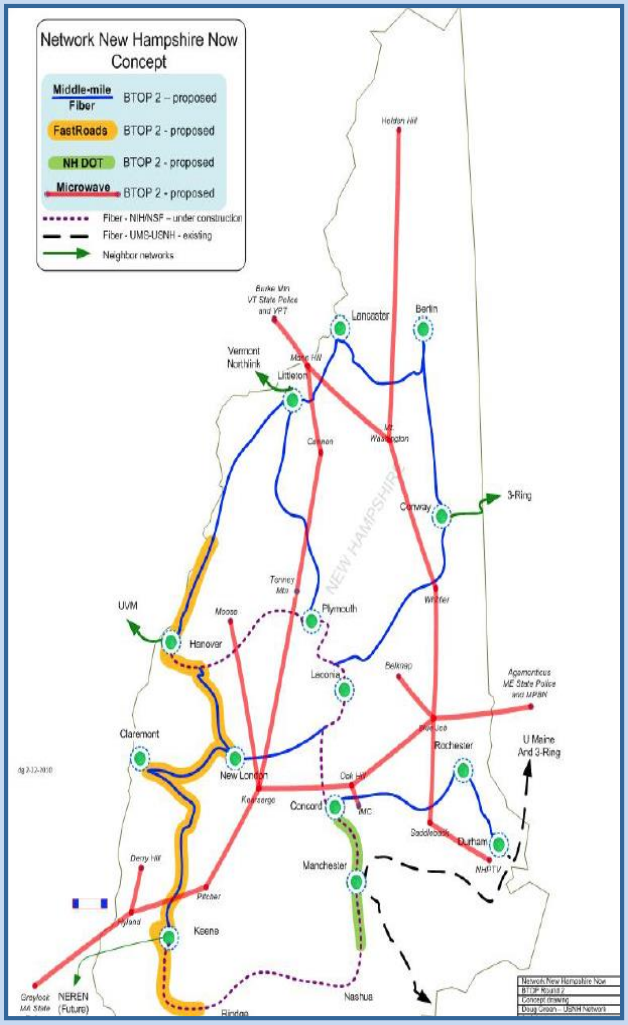
Some police departments around the region are communicating information to residents on social media, joining platforms such as Facebook and Twitter. The City of Concord's Police Department has a Facebook page and residents can follow the Pittsfield Police Department on Twitter @pittsfieldnhpd.

Social media is a growing avenue of valuable communication and citizens expect government to use social media and use it well.

IMPROVING PUBLIC SAFETY
NETWORK NEW HAMPSHIRE NOW

Network New Hampshire Now (NNHN) is a program run through the University of New Hampshire focused on providing broadband connectivity through all portions of the state by providing the installation and expansion of middle-mile fiber, last mile fiber, and a middle-mile microwave network. The middle-mile microwave network connects to the fiber network through towers located on top of mountains across the state providing broadband, mobile access, and public television to areas previously without coverage. The increase of mobile access and broadband greatly benefits public safety as it allows first responders the tools to quickly respond to emergencies. It also allows those in need to have access to coverage to call for help in previously uncovered areas.

The map to the right shows the project as proposed in 2010. The microwave network can been seen with the red lines, connected by mountaintops throughout the state. The project was completed in December of 2013, and additional information can found on the program's website: www.networknhnow.org.



Economic Development

Broadband and broadband-dependent applications allow small businesses to increase efficiency, improve market access, reduce costs and increase the speed of both transactions and interactions. New Hampshire and the region have many small businesses, and supporting their growth and success is an economic development focus. As part of the development of the Comprehensive Economic Development Strategy (CEDS) for the region, broadband infrastructure and cell service telecommunications are included as a very important industry factor, yet the status in the region is reported as weak. To plan for economic development, one of the objectives is to expand broadband services and other information technologies with the goal of developing, maintaining, and strengthening adequate telecommunications infrastructure.

Many of the business owners and economic development stakeholders in the region noted the necessity of reliable, high-capacity broadband for operating a successful business. Usually located in the more rural areas of the region, those small businesses and home-based businesses expressed needs for more bandwidth, faster upload capacity, and multiple carriers for redundancy and uninterrupted service.

CONNECTIONS: ECONOMIC DEVELOPMENT STRATEGY AND BROADBAND

The 2014 Central /Southern NH Comprehensive Economic Development Strategy (CEDS) is an in-depth analysis of the regional economy and the development of regional economic development strategies and projects for the area that includes all 20 CNHRPC communities as well as five communities (Bedford, Goffstown, Hooksett, New Boston, and Weare). The provision of improved broadband in the region's rural areas was a key point of discussion and emphasis during the development of the CEDS Strengths, Weakness, Opportunity, Threats (SWOT) analysis. As a result, several CEDS priority projects in the Central NH Region directly relate to broadband infrastructure and online applications.

Community	Project	Project Description
Canterbury	Broadband Planning	Explore options for the development of broadband in Canterbury.
CNHRPC region	CEDS Region Website	Develop regional web portal.
CNHRPC region - Sutton, Salisbury, Bradford, Warner, Webster	Regional Broadband Internet Access	Feasibility analysis to examine options for providing broadband Internet access.

Source: The Central/Southern NH Comprehensive Economic Development Strategy

Residential

Taken as a whole, there is a wide spectrum of broadband speeds found in the residential sector around the region. The City of Concord and many of the surrounding communities have or will soon have access to fiber optic broadband connections. In other areas there are some gaps in the region where no, or very spotty, broadband coverage is available. There are many more areas where residents desire higher bandwidth for faster connections.

Residents are integrating broadband Internet into home life more and more. Broadband functions are used for communication, work, and entertainment and the demand for better broadband at home is expected to increase. The ability to run a home business or telework is an integral component to the success of the region now and in the future. Realtors report that broadband connection and coverage are among the first questions asked by potential home buyers. Broadband is part of the equation to consider for the region to continue being attractive as a desirable place to live and run a business.

BROADBAND CONNECTIONS: REAL ESTATE

The relevance of broadband in the real estate market has changed drastically over the last several years. Real Estate Agent Laura Hallahan of Tall Pines Realty in Bradford has been selling real estate in the region for over 15 years. She says of broadband, "It is in the top five questions, if not the first question, that prospective owners ask." While the presence or absence of a broadband connection does not quantifiably affect the listing price, houses that do not have broadband access often will not be considered by a prospective buyer.

Broadband connection tends to play a larger role for prospective buyers in the second-home market who may be from southern New England and have come to expect high-speed Internet access in their work and home life. For buyers who are from the area they often are aware of the broadband coverage and they may not currently have broadband at home. She expects to see broadband continue to play a role in the real estate market, where houses with broadband access are more desirable to buyers and houses in those areas without coverage tend to stay listed for longer. Recently a seller made certain that this listing included the broadband connection information, "5 megabit DSL available at this location."

CHALLENGES AND FUTURE NEEDS

Limited Resources

The broadband related challenges for many of the sectors stem from the reality of limited resources to obtain the best technology, technology support and staff training. Limited financial resources, but also staff resources, time and information to dedicate to the issues are challenges. Schools, libraries and local government departments experience limited resources most critically. For many municipalities and town departments these challenges exist in an environment of tight, local budgets in small communities.

While stakeholders in many of the sectors felt that current broadband connections were sufficient for current needs, there are many emerging technologies to consider that are already being implemented in other communities. In public safety, the ability to use real-time high-quality video in a remote location or sending building blueprints to fire responders requires a high level of broadband capability that can be useful to public safety responders.[5] As new broadband applications and technologies are made available to emergency responders, the challenge becomes the financial resources available to obtain the new technology, including education and training.

Schools often face financial challenges in bringing high-capacity broadband to the classrooms due to limited budgets and small community schools. Many of the schools in the region report speeds under the recommended capacity outlined by the State Educational Technology Directors Association of 100

[5] Federal Communications Commission, Public Safety Tech Topic #22. http://www.fcc.gov/help/public-safety-tech-topic-22-application-emerging-wireless-broadband-technology-public-safety-co. Accessed 2/19/14.

megabits per second for every 1,000 students and staff by 2014.[6] There are initiatives, such as the national ConnectED that address the issue of connecting schools in environments of limited resources. Education stakeholders noted the importance of providing information about the need for technology in schools and education to the decision makers so they can make informed decisions. One teacher in the region reported that "It's always the first budget item that gets cut. We are always reactive and not proactive in moving forward in 21st century learning."

ConnectED INITIATIVE

In June 2013, President Obama announced the ConnectED initiative, designed to enrich K-12 education for every student in America. Nationally few than 30% of America's schools have the broadband needed to teach using today's technology. The ConnectED initiative will, within five years, connect 99 percent of America's students to next-generation broadband and high-speed wireless in their schools and libraries. The FCC and private sector technology companies are collectively pledging to connect 20 million more students through 2015. ConnectED will also provide better broadband access for students in rural areas, by expanding efforts to connect parts of the country that typically have trouble attracting investment in broadband infrastructure.

To learn more about how ConnectED works visit:
www. http://www.whitehouse.gov/issues/education/k-12/connected.

Emerging Technology

Across many of the sectors, stakeholders face the challenge for staying current with emerging technology. School and municipal departments report difficulty with keeping up with rapidly changing technology, both from a resource perspective and limited capacity. For other sectors, the challenge is the same - keeping up with information on rapidly changing technology, and finding the resources to dedicate staff time. A local police department representative noted, "As with most projects, [the challenge is] money and time. I can't stay on top of the new technology, so we [would] need to pay someone to be paying attention to what we should be purchasing."

There are many emerging technologies dependent on broadband that aim to improve efficiency, but often require significant investment of resources, time, and information. The smart grid technologies have promise of reducing costs and advancing energy independence, goals that are expressed in the National Broadband Plan. Many education institutions are incorporating online classes and degree programs, and high-speed broadband connections are needed to access these educational and training

[6] C. Fox, J. Walters, G. Fletcher and D. Levin, "The Broadband Imperative: Recommendations to Address K-12 Education Infrastructure Needs," *State Education Directors Technology Association*, 2012, http://www.setda.org/web/guest/broadbandimperative. (accessed July 17, 2013).

opportunities.

In addition to facing the challenge of keeping up with emerging technologies, municipal stakeholders report a lack of information about how to access or improve broadband coverage or connections in their departments or in their communities. Many local officials interact with frustrated residents who do not have access to adequate broadband and are looking for local government assistance to improve broadband speeds and availability. While broadband is provided by private companies and there are not very many opportunities for the public sector to influence changes, there is a demand by stakeholders for better information about how to improve the current condition. The lack of information or limited capacity to understand how to improve broadband connections or utilize emerging technology is a barrier for some stakeholders.

BROADBAND CONNECTIONS: ENERGY AND SMART GRID TECHNOLOGY

ISO New England Inc., the operator of the region's bulk power system and wholesale electricity markets, received U.S. Department of Energy funding in 2010 for a three year project that began work on the first steps to implement "smart grid" technologies. The electric power industry, state and federal regulators, government agencies, and academics have been grappling for years with how to best update the aging electric power infrastructure. This particular project installed more sophisticated data collection devices, known as phasor data concentrator devices, in 40 substations on the New England region's high-voltage transmission system. Completed in 2013, New England now has the beginnings of a technology platform on which the next generation of monitoring and analysis tools can be developed with the ability to measure positive sequence voltages with time stamp within as microsecond and lead to more accurate monitoring in the control room.

Congress directed the FCC, in its development of the National Broadband Plan, to include a plan for "the use of broadband infrastructure and services in the advancement of energy independence and efficiency." The general consensus is that an updated grid not only must secure the future reliability of the power system in light of the ever increasing demand for electricity, but it also must operate with greater efficiency.

The use of the terminology "smart grid" is really about adding communications to the electrical system. One of the factors in the development of an updated grid (i.e. smart grid) is the ability of wireless technology to communicate in real time between a utility and its customers. How this technology will work as the smart grid comes online and there is a significant amount of traffic is a challenge as wireless signals with adequate bandwidth can become sluggish. The intent of these advanced technologies combined with demand response initiatives can optimize the efficient operation of the power system, improve reliability, and provide consumers with new tools to better manage their electricity consumption and costs. Broadband has the potential to give the smart grid the speed and bandwidth it needs for updates on usage, when can then be disseminated back to consumers.

Unlike standard AMI (Advanced Metering Infrastructure) technology used in the utility industry, broadband opens up the data pipeline and allows faster access into the home. How this will impact deployment of broadband into more rural areas is something to watch in the future. Although broadband is not required for smart grid capabilities there has been some discussion that municipal and electric cooperatives making the push into broadband services are using the grid modernization as a part of the rationale.
Source: http://www.fcc.gov/topic/smart-grid and http://www.iso-ne.com/

Rural Locations and Gap Areas

Across all sectors, rural locations and gap areas within the region are a challenge. The limited broadband availability in some areas, as well as intermittent wireless service and cell phone coverage, makes it difficult to operate some of the necessary online applications. In the healthcare sector, the rural location of a satellite health facility presents a challenge for providers at one location where the coverage does not support certain online applications, including the prescription drug or medical information on hand-held devices. Healthcare stakeholders noted the vision for healthy communities and adequate healthcare in the Central New Hampshire Region requires better coverage of broadband throughout the entire region.

Limited Choices in Providers

For the sector stakeholders whose current level of broadband is not sufficient, the challenges include a lack of options or alternatives, not necessarily resources, for increased broadband and multiple providers. For home-based businesses in the areas where there is more limited service, DSL or mobile broadband are often the only options available. Providers are often unwilling or unable to discuss the options for build out plans or feasibility of providing services. This leads to a sense of frustration for some business owners who see the necessity for better broadband in their plans to improve or expand their business. Unlike other sectors, the business sector does not mention a lack of resources as a barrier, but instead is focused on the lack of what the current infrastructure provides. Residents express frustration with the status quo being the only option available to them.

Financial Barriers

Although financial barriers were not frequently mentioned as a major barrier for most stakeholders, the cost of acquiring service is a barrier to some. As discussed in the demographics and trends section, there are populations in the region who may face financial barriers in accessing broadband connections and the computer technology required to use it. The financial barriers most negatively affect students. In a 21st century education, broadband use and applications are used both in and out of the classroom. For the students in the region who do not have high-speed Internet access at home, teachers provide hard copy paper assignments and other options. This becomes a challenge for students to complete assignments at the expected level and becomes a concern for equal opportunity in education and achievement in the workforce. Schools, public libraries, and educational institutions play an essential role in educating students and providing job readiness and training for the workforce. Finding creative ways to overcome these barriers for individuals while continuing to offer high-caliber technology-based education and training is a challenge for the regions' education and economic development sectors.

DIGITAL OPPORTUNITY CONSORTIUM

The partners of the national Digital Opportunity Consortium include a diverse range of organizations across the country and in New Hampshire, including the NH Society for Technology in Education and NH School Library Media Association. To work towards closing the digital divide at home for the nation's low-income schoolchildren and their families, the Consortium works in partnership with communities, states, schools and companies. Programs aim to provide digital access at home at the lowest possible cost for broadband, computing devices, educational content for K-12 curriculum, tech support and low-interest financing for families with poor credit. For example, the Consortium works closely with Comcast to ensure that low-income schoolchildren and their families who qualify for free or reduced school lunch living in communities served by Comcast have access to their Internet Essentials program. The program offers high speed home Internet for $9.95 per month for eligible families. The Consortium is seeking partnerships with additional broadband providers interested in offering reduced-cost home broadband service to the nation's lower income children and their families. For more information on Comcast's Internet Essentials program visit: www.internetessentials.com. For more information on the Digital Opportunity Consortium visit: www.digitalopportunityforall.org.

Broadband plays an integral role in many of the region's sectors and there is evidence of growing demand for broadband use and applications. Emerging technologies are providing opportunities and efficiencies in different sectors, such as online distance learning programs and telehealth applications. Many of the sectors face common challenges such as limited resources, staff time and training, and limited capacity for integrating emerging technologies and information. In rural areas there are gaps in coverage that create barriers to business development and teleworking and frustrate residents who are looking for high-capacity broadband at home. There are opportunities that can support broadband expansion and improvement, from federal programs in education to local projects identified in the region's Comprehensive Economic Development Strategy (see Economic Development sector analysis). The sector-based analysis lays the foundation for the following sections that further refine the overarching challenges and barriers and identify a set of strategic actions that can address those challenges.

CHALLENGES/BARRIERS

Barriers to improved broadband in the region were discussed by the Broadband Stakeholder Group and at the public forums throughout the timeframe of the project. Identified barriers largely fall into four categories; data/information, regulatory, economic, and technology.

DATA BARRIERS

- Mapping Accuracy – The spatial information available is only detailed to the census block level. The result is an over-reporting of coverage due to the fact that even if one residence within the census block has coverage, the entire census block is displayed as receiving coverage. The lack of accurate information can make it difficult for policy makers and municipalities to know the extent or lack of broadband coverage.

- Access to Information – For residents, there is often limited guidance on how to proceed if they are without broadband coverage or are unsatisfied with the level of service. This also holds true for municipalities who are not well equipped to provide assistance to businesses and residents on broadband availability or coverage issues.

REGULATORY BARRIERS

- Cable Franchise Agreements – By law, all cable TV franchises are non-exclusive, meaning that a municipality could grant franchises to multiple cable companies. The economic reality is that very few cable providers have chosen to seek a franchise in a municipality that is served by one cable company, based on economics. As broadband services are now often included in the service packages available by the cable companies, there may be barriers to increased broadband coverage and competition by the cable companies' reluctance to build out into unserved areas with low densities. As many communities are approaching the expiration of cable franchise agreements, there is an opportunity to renegotiate for improved coverage and service. There is a strong interest by local officials for more information about cable franchise agreements and how to negotiate for improved broadband service.

- Deployment – Broadband providers face difficulty in deploying the broadband infrastructure to new areas because of the time consuming and often costly process of securing locations on utility poles.

- Utility – Although often thought of as a public utility, broadband does not fall under the jurisdiction of the Public Utilities Commission except to the extent that Internet service providers seek the PUC's jurisdiction to resolve pole attachment disputes. Local governments have difficultly negotiating for improved broadband coverage since broadband companies operate in the private sector.

ECONOMIC AND EQUITY BARRIERS

- Return on Investment – The investment required to provide broadband to residents in low population density areas is often considered too high by Internet providers. The return on

investment is not considered adequate for the private sector to provide broadband to some of the more rural areas in the region.

- Cost to Residents – In some cases the cost of Internet and computer technology is prohibitive for low-income families or seniors on fixed incomes. For low-income families with children, the prohibitive cost may be an equity concern in terms of education, job access, and opportunity for all children to succeed in the 21st century. [7]

TECHNOLOGY BARRIERS

- Fiber to the Home – In a rural environment, some broadband companies have determined that the deployment of the latest broadband technology may not be feasible because of the amount of technological infrastructure needed in rural areas. The exception in the Central NH Region is TDS, for the limited areas in which the company has a telephone franchise.

- Redundancy – Major institutions relying on consistent, un-interrupted Internet service, such as hospitals and businesses, need to have redundancy, or multiple Internet connections available, in case one system is interrupted by power failure or other system failure. There is a need for coordination of Internet connections in order to provide consistent and constant service.

- Technology Upgrade – DSL covers some of the gaps in communities left by cable companies not running cable lines all the way to the end of a rural road. Residents who live at the end of the DSL 'reach' have much slower speeds than neighbors closer to the central office. For home businesses, or small businesses, broadband upgrades need to be made available for these businesses to fully function.

[7] The FCC required Comcast, as part of its acquisition of NBC UniveBal, to provide very low cost (1) Internet service and (2) home computers to families that qualify for the free and reduced-price school lunch program. Families that qualify may receive Internet service for $10.95/month and a computer for $149.50. The program is still in operation. Families can continue in the program and learn more and sign up at www.internetessentials as long as their child or children are in public elementary or secondary school.

OPPORTUNITIES

It is clear from a thorough review of the Challenges/Barriers, that there are numerous opportunities for addressing these barriers across the region. Rather than identify these opportunities in a separate section of this Plan, they are incorporated into the following SWOT (Strength, Weaknesses, Opportunities and Threats/Challenges) analysis that follows. The SWOT analysis was used to inform the Goals and Objectives as well as the Strategic Action Items.

The following vision statement brings together the SWOT analysis, data analysis, and the concerns expressed throughout the public outreach process. The objectives and strategic actions that follow the vision serve as a framework for working on priorities and implementation actions that benefit the municipalities in the Central NH Region.

VISION

Every home, business, and place of education in the Central NH Region has ACCESS to reliable, high quality, affordable, high speed broadband infrastructure and services.

GOAL: Work toward an improved broadband infrastructure across the region to provide reliable broadband technology that can adapt over time to serve the region with competitive and relevant broadband technology.

Objective 1

Connect most recent and emerging technology with other regional initiatives to support reliable broadband technology.

Strategic Actions

1. Encourage municipalities to adopt this Regional Plan by reference.
2. Create a dedicated section on CNHRPC's website for broadband information important to the region. Include trainings, upcoming legislation, articles, and resources.
3. Link action items in the regional broadband plan to other regional plans such as CEDS, Regional Master Plan, etc.

Objective 2

Support continued deployment of high-fiber optic networks throughout the region to community anchor institutions, businesses, and to end users with fiber to the home.

Strategic Actions

1. Investigate the creation of a public/private project to support an open access fiber network in areas where broadband need will not be filled by the private sector.
2. Promote the adoption of policies that promote the installation of broadband infrastructure, including broadband conduit, when construction occurs in road right of ways.
3. Support local efforts to ensure adequate broadband connections to public facilities.

GOAL: Engage in activities that work towards closing broadband coverage gaps in the region.

Objective 1

Identify and monitor geographic areas where there are gaps in service.

Strategic Actions

1. Continue participation in the UNH mapping program and broadband speed test.
2. Coordinate with local communities regarding gaps and needs for broadband.

Objective 2

Stay informed on efforts to increase broadband deployment in the areas where gaps are identified.

Strategic Actions

1. Participate in any statewide/regional working groups that are convened to:
   a. Explore the development of alternative broadband delivery technologies and other emerging technologies.
   b. Continue the expansion and improvement of wireless networks.
   c. Encourage municipalities to proactively negotiate renewal of cable TV franchises to address lack of service areas.

Objective 3

Support the removal of regulatory barriers to broadband expansion.

Strategic Actions

1. Support legislation that permits municipalities to bond for broadband and investigate other municipal financing options for broadband projects.
2. Support measures that expedite the current process for securing pole attachments and other infrastructure installment processes, as appropriate. Provide educational materials to communities related to this issue.
3. Review local regulations to identify any unintended restrictions or barriers to the installation of broadband infrastructure; advise municipalities of the results and assist in revising, as requested.

Objective 4

Encourage the creation of choices in providers, quality of service, and cost in broadband plans throughout the region.

Strategic Actions

1. Support regulatory approaches that encourage multiple providers, including municipal network providers and private providers, to offer services in the same area.

Objective 5

Support municipalities in advocating for broadband coverage in the gap areas within the municipality.

Strategic Actions

1. Develop resources for residents that discuss how gap areas in town could obtain coverage.
2. Provide municipalities with training on how to interpret, maximize, and negotiate Cable Franchise Agreements with providers to expand coverage to gap areas and upgrade speeds.
3. Provide targeted guidance on how to address challenges for residents in underserved areas.

GOAL: Support widespread broadband adoption in the region and position broadband as an important infrastructure to the region's economic development, quality of life and viable future.

Objective 1

Assist municipalities, residents, businesses, community stakeholders in understanding how broadband is important to the development of the economy and community.

Strategic Actions

1. Publicize available broadband trainings through UNH and other statewide or regional educational resources.
2. Work with other partners to provide community-level training in digital literacy at public institutions.
3. Look for new, cross sector partnerships to improve broadband development.
4. Share information with local officials on legislative bills and other policy changes that may impact broadband deployment and services in the state.

Objective 2

Organize community support for broadband networks, particularly to public locations and/or areas of underserved communities.

Strategic Actions

1. Support public access to digital technology and broadband networks at public institutions.
2. Support programs that focus on digital literacy and access among traditionally lower-use populations.
3. Identify / publicize programs designed to subsidize broadband access for underserved communities or select user constituencies in an effort to reach universal access.

Objective 3

Encourage municipalities to identify broadband as a priority in local planning.

Strategic Actions

1. Develop guidance on incorporating telecommunications into local master plans, local regulatory framework, and pole attachment criteria.
2. Encourage municipalities to organize technology committees to plan and prioritize for improved broadband in town.
3. Provide information to municipalities on the reinvestment of cable franchise fees for future broadband improvement projects.
4. Adopt policies and amend zoning to promote ubiquitous broadband.
5. Use opportunities in RSA 12-K to encourage co-location for wireless facilities to fill gaps, in most needed and desirable areas, including on municipal facilities or property.

Objective 4

Support the formation of a Regional or Sub-Regional Broadband Advocacy Group(s).

Strategic Actions

1. Increase dialogue related to cable franchise agreements, pole attachments and best management practices for communities.
2. Support legislation of mutual interest to communities.
3. Reach out to non-traditional groups, such as realtors, to discuss broadband connectivity and its impact on the real estate market in the region.

WHAT MUNICIPALITIES CAN DO:

It is recommended that municipalities consider the following actions. These actions are organized by the governmental bodies that would have responsibility for implementation of the recommendations:

GOVERNING BODY: Board of Selectmen, Town Council, or City Council

1. Inventory municipal buildings that may be suitable for siting of personal wireless service facilities under the provisions of RSA 12-K:10 which allows the siting of such facilities on any structure which is capable of structurally supporting the siting. This initiative will allow for potential complementary additions to the broadband infrastructure of the municipality through introduction of wireless broadband services, and add rental and tax revenue to the municipality.
2. Adopt policies governing the public rights-of-way for the installation of telecommunications facilities within those rights-of-way.
3. Adopt, outside of any cable franchise negotiations, a policy stating the basic municipal objectives sought through cable franchising (i.e. ubiquitous, cable plant extension, access programming service to public library and other public buildings).
4. Encourage the municipal planning board and ultimately the municipal legislative body to review and legislate wireless zoning in a manner which is consistent with municipal policy and values.
5. Consider drafting and adopting a comprehensive telecommunications ordinance stating the policies of the municipality governing the public rights-of-way, stating cable franchise policies, incorporating by reference the wireless telecommunications facilities ordinance adopted by the legislative body and stating the municipal policy promoting the siting of such facilities on municipal law, including a funding mechanism by which right-of-way fees, rental fees from wireless siting, and franchise fees from cable franchises could be reserved for use by the municipality to promote broadband infrastructure.
6. Consider the adoption of the report and recommendations of the Central New Hampshire Regional Broadband Plan.

MUNICIPAL PLANNING BOARD

1. Review the existing master plan to determine whether the master plan addresses the telecommunications infrastructure of the municipality, as required by RSA 674:2 (g).
2. To the extent the master plan does not address or adequately address telecommunications infrastructure, amend the master plan pursuant to RSA 674:4 and RSA 675:6 to include such a section and to incorporate by reference the findings and recommendations of Central New Hampshire Regional Broadband Plan.

LEGISLATIVE BODY

1. Adopt wireless zoning which promotes the deployment of wireless broadband services in a manner consistent with the siting values of the municipality;
2. Be prepared to approve the leasing of space on municipal buildings for the siting of Personal Wireless Service Facilities. If not already implemented and applicable, consider adopting the provisions of RSA 41:11-a to delegate to the Board of Selectmen the authority to lease municipal property.

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APPENDIX A: NHBMPP PROGRAM COMPONENTS & OBJECTIVES

The New Hampshire Broadband Mapping and Planning Program (NHBMPP) was comprised of several components, including a broadband availability inventory and mapping effort and a suite of planning and technical assistance initiatives. Following are brief descriptions of these components as well as an overview of the broadband planning initiative.

MAPPING

In 2010, UNH, the RPCs, and other partners began an inventory and mapping effort aimed at mapping the current availability of broadband throughout the state through several projects and activities, which include:

- Collecting data semi-annually from the public and commercial entities that provide broadband services in New Hampshire on the location, type and speed of broadband technology available in the state;
- Surveying and mapping the broadband availability at community anchor institutions (CAIs) such as schools, libraries, hospitals, emergency management facilities, and municipal buildings in New Hampshire;
- Developing the first public master address file of households located in rural census blocks for the state through the NH Rural Addressing Project;
- Further refining the information collected on broadband availability through the broadband mapping component with municipal stakeholders and representatives through the Municipal Broadband Service Map Verification Project;
- Sharing information and data on broadband availability in the state with the NTIA and the Federal Communications Commission (FCC) on a semi-annual basis for inclusion in the National Broadband Map; and,

TECHNICAL ASSISTANCE AND TRAINING

UNHCE took the lead on developing and administering technical assistance and training opportunities to help businesses, organizations and individuals better understand the importance of and applications for broadband in today's world. The activities undertaken by UNHCE through the NHBMPP included:

- Assessing the technical needs of stakeholder groups including educational institutions, small businesses, local governments and nonprofits through the creation and administration of sector-based surveys;
- Developing tools and learning modules on topics related to broadband utilization and adoption such as ways for municipalities to promote or market themselves via the Internet;
- Delivering technical assistance and training to stakeholder groups; and,

CAPACITY BUILDING

A third component of the NHBMPP, capacity building, was focused on the development of tools and resources necessary to implement broadband projects within communities and regions across the state.

In addition to conducting trainings, UNHCE developed a training program and online modules to assist communities, available at www.iwantbroadbandnh.org. These modules include:

- Organizing a group or community;
- Performing Assessments, developing a plan;
- Implementation;, and
- Funding

The Director of Broadband Technology, a position established within the NH Department of Resource and Economic Development, coordinates and provides leadership on statewide telecommunications policy initiatives such as:

- Encouraging collaboration to establish best practices in policy management, financial resources, and advocacy for business and residential broadband;
- Tracking and reviewing legislation related to broadband and telecommunications;
- Serving as a resource for state policy makers to develop policies geared towards increasing access to and expansion of broadband infrastructure;
- Working with the NH Telecommunications Advisory Board, to analyze and assess the state's broadband infrastructure and promote access to affordable and reliable advanced telecommunications services; and,

PLANNING

In 2011, NHBMPP partners engaged in a four-year effort aimed at incorporating the information and momentum gained during the mapping activities to better understand current broadband availability in New Hampshire and plan for increased broadband adoption and utilization through outreach, community engagement, and surveying activities.

As part of an effort to gain a better understanding of broadband at the regional level, each RPC developed a broadband stakeholder group (BSG), comprised of individuals representing a wide range of sectors, which met quarterly. The BSGs played a vital role in assisting regional planning commissions in assessing the need for improved broadband capability, availability, and affordability. The BSGs helped the RPCs develop a list of broadband needs and barriers to broadband adoption and utilization as well as determining goals, objectives, and strategies to overcome barriers in each region.

A major undertaking of the broadband planning component was a sector-based analysis. This activity involved developing and facilitating focus group meetings, structured interviews, and other methods to identify broadband needs and challenges specific to various sectors, including healthcare, education, local government, economic development, and public safety. Each planning commission conducted focus groups or interviews with representatives from these sectors to better understand the importance of broadband accessibility to each sector.

Additionally, each RPC held public forums throughout the course of the project. These forums were an opportunity to share information regarding ongoing broadband efforts in the region, progress of the NHBMPP, and to receive feedback from community members regarding broadband availability.

A.2 Central New Hampshire Region Broadband Plan

Information gathered from the activities described above led to the development of nine regional broadband plans in NH. Each RPC reviewed and analyzed data collected through the mapping efforts, outreach activities, sector-based analysis, as well as public forums to develop comprehensive documents that highlight the current landscape of broadband availability in the state and identify ways to increase broadband adoption and utilization. The regional broadband plans serve as guidance documents for communities, policy makers, businesses, institutions, and residents to better understand the availability and need for and utility of broadband now and into the future. All nine plans are compiled into a statewide broadband planning document released by UNH.

APPENDIX B: NHMBPP BROADBAND MATRIX

The NHBMPP developed the matrix below to assist in understanding the diverse levels of broadband available in the state today, and the typical functions a user might be able to perform within a range of download and upload speed tiers. Using these tiers, the NHBMPP established broadband availability categories ("served", "underserved", and "unserved") to describe access to broadband service. These categories are based solely on the maximum speeds available to the end-user or end-device. While some states are also considering the number of providers servicing a given area when determining access levels, e.g. a degree of competition, the NHBMPP chose not to incorporate those analyses in this availability category distinction.

When using the matrix to evaluate access, determine the category by assessing both the download and upload speeds. Most broadband technologies (cable, wireless, satellite, etc.) are not capable of sending and receiving data at the same speed, with upload speed typically being more limited.

As broadband functions, applications and technologies are continually changing, these analyses do not seek to supersede other national and/or state efforts to establish a standard definition for "broadband". Only 15 years ago, a 56 kbps connection was sufficient to conduct most business on the internet. Today, in order to use many internet applications successfully, a minimum download speed of 3 mbps is required. This trend towards increasing requirements for bandwidth capacity will certainly continue into the future, and the matrix of uses presented herein will evolve as well.

This document does not seek to supersede other national and/or state efforts to establish a standard definition for "broadband." These categories are based solely on the maximum speeds available to the end-user or end-device. It also limits the focus to transmission speed, while recognizing that affordability and functionality are also key factors when assessing broadband needs and barriers to adoption. While some states also consider the number of providers servicing a given area when determining access levels, e.g. a degree of competition, the NHBMPP chose not to incorporate those analyses in its availability categories.

NHMBPP Broadband Matrix

Category	*Download Speed*	*Upload Speed*	*Typical Functions/Use (functions additive to level above)*
Unserved	**< 768 Kbps**	**< 200 Kbps**	• Email (Client/Server-based; POP)
Underserved	**768 Kbps to < 6 Mbps**	**200 Kbps to < 1.5 Mbps**	**Minimum Download Speed: 768 Kbps** | **Minimum Upload Speed: 200 Kbps** • Web-based email • Limited web browsing and shopping • Minimal social media use • Sending/receiving small documents/files (photos, word processing, invoices) • Use of internet not integrated in daily life function • Single user internet device **Minimum Download Speed: 1.5 Mbps** | **Minimum Upload Speed: 768 Kbps** • Web browsing and shopping • Medium social media use • Sending/receiving medium-sized documents/files (photos, word processing) • Limited streaming content; buffering a concern Standard Definition (SD) content • VPN access possible, but speed of operation not critical to job function • Internet integrated in daily life, and "always" connected • 1-3 simultaneous internet devices possible • Multiple functions working simultaneously possible (e.g. web browsing, streaming video/music, downloading content). Not concerned with speed of transmission. • VoIP (Voice over IP, i.e. telephone over the Internet) **Minimum Download Speed: 3 Mbps** | **Minimum Upload Speed: 768 Kbps** • Medium to high social media use • Sending/receiving medium to large-sized documents or files (photos, word processing) • Streaming SD content; buffering not a concern; downloading High Definition (HD) content (movies, video) • 3-5 internet devices possible • VPN access needed, speed of operation important but not critical to job function • Multiple functions performed simultaneously required (e.g. web browsing, streaming video/music, downloading content), but not concerned with speed of downloads • Low quality, small window frame videoconferencing (Skype) • Cloud-based computing and data storage
Served	**6 Mbps to 25+ Mbps**	**1.5 Mbps to 6+ Mbps**	**Minimum Download Speed: 6 Mbps** | **Minimum Upload Speed: 1.5 Mbps** • Heavy social media use • Sending/receiving large documents or files (photos, word processing, small videos) • Streaming HD content (movies, video); buffering not a concern • 5+ internet devices possible • VPN access needed, speed of operation critical to job junction • Higher quality, codec-based videoconferencing • Multi-player online gaming

<table>
<tr><td rowspan="5">Served</td><td rowspan="5">6 Mbps
To
25+ Mbps</td><td rowspan="5">1.5 Mbps
to
6+ Mbps</td><td>Minimum Download Speed: 10 Mbps</td><td>Minimum Upload Speed: 3 Mbps</td></tr>
<tr><td colspan="2">• Sending/receiving large files and small to medium-sized databases
• HD quality, codec-based, large frame videoconferencing; multiple (bridged) sites/users
• Remote synchronous education, professional development, workshops, etc., facilitated simultaneously at multiple classrooms and/or other locations
• Telehealth/telemedicine applications possible</td></tr>
<tr><td>Minimum Download Speed: 25+ Mbps</td><td>Minimum Upload Speed: 6+ Mbps</td></tr>
<tr><td colspan="2">• Sending/receiving medium to large-sized databases
• HD quality, codec-based, large frame videoconferencing (Telepresence) connecting multiple (bridged) sites/users
• High speed end to end network and business to business applications
• Telemetry-based applications (rely critically on the ability of broadband to continuously monitor and multiplex data, i.e. remote patient monitoring, sensing systems, etc.)
• Real-time HD medical imaging and consultation (remote dermatology, etc.)
• “Internet 2” connectivity and applications</td></tr>
</table>

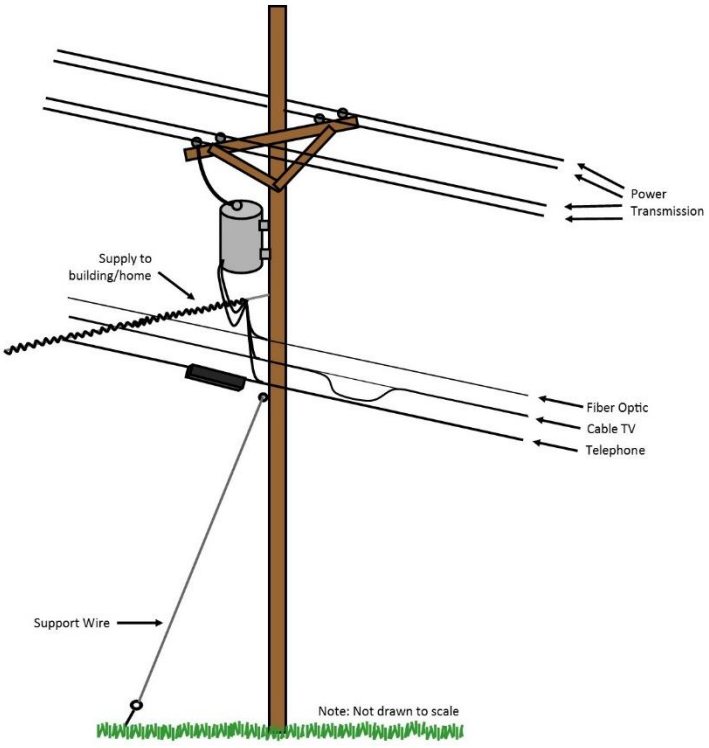
APPENDIX C: BACKGROUND INFORMATION

UNDERSTANDING BROADBAND

As our technology capabilities are continually changing, it is important to define what broadband is so that stakeholders can determine where broadband is currently available, and how it can be made more widely available to more people.

Broadband is defined in terms of how fast the user's computer can download and upload information from the Internet. Download speed is the rate that a computer receives data from the Internet while upload speed is the rate a computer can send data. The speed at which information can be transmitted depends on bandwidth. Bandwidth is the transmission capacity of an electronic pathway. That capacity can be described in terms of how much data, measured in bits, can be transmitted per second, and is reported in kilobits (Kbps), megabits (Mbps), and gigabits (Gbps). Most broadband technologies have different downloading and uploading speeds, with upload speed typically being more limited. As technology and applications are continually evolving, there are and will continue to be many different types of broadband services as well as resulting speeds and functions while using the Internet.

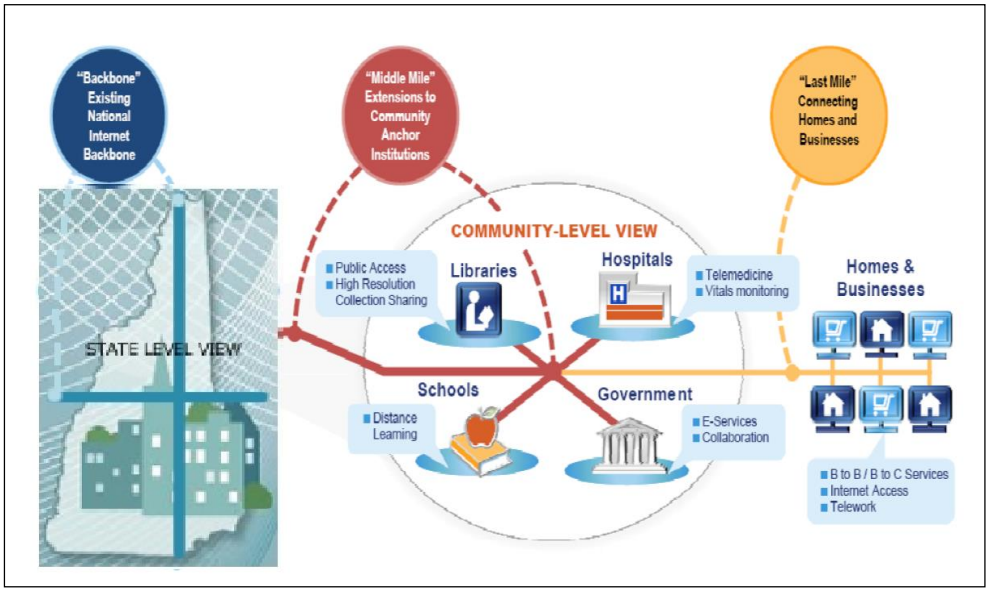
NTIA defines "broadband" as providing a minimum speed of 768 Kbps download and 200 Kbps upload. Although NTIA defines broadband at a 768 Kbps minimum download threshold, even this level does not provide adequate functionality. Even download speeds up to 3 Mbps have limited functionality. In order to use a more realistic definitions of broadband, the broadband matrix developed by NHBMPP in **Appendix B** sets the threshold of 'served' at 6 Mbps download reflecting that speeds below that level are considered 'underserved' with limited functionality. At up to 3 Mbps, Internet users are able to use web-based email, send and receive small to medium-sized documents, and browse the web. However, operating multiple functions may cause potential slowness, making it difficult to conduct necessary business and education operations. Today, in order to use many Internet applications successfully, a minimum download speed of 3 Mbps is required. From 3 Mbps to 6 Mbps download speed, and 1.5 Mbps to 3 Mbps upload speed, users can send and receive photos and word documents through email, conduct multiple functions simultaneously, and access small window videoconferencing, such as Skype. At 6 Mbps to 10 Mbps download and 3 Mbps to 6 Mbps upload, users can send and receive large documents and files, such as small videos, and can access their employer's networks while traveling or working from home, with a speed of operation that is similar to being in the office. Also, higher quality videoconferencing



can be conducted, allowing businesses to communicate with clients, partners, and employees. At 10 Mbps to 25 Mbps download and 6 to 10 Mbps upload, telemedicine and telehealth applications are possible and remote education, professional development, and training workshops can occur in high definition (HD) quality. At 25+ Mbps download and 10+ Mbps upload, real time HD medical imaging and consultation can occur.[8] As Internet technology and applications continuously emerge and evolve it takes much more than the minimum broadband threshold defined by NTIA to operate successful businesses, and provide relevant education and quality medical care.

How Broadband Works

Broadband infrastructure consists of an Internet "backbone," a "middle mile" component, and a "last mile" or local network plant. The Internet "backbone", is hosted by large commercial, government, academic, and other high-capacity network centers. The "middle mile" refers to the segment linking a network operator's core network to the local network plant, or "last mile." The "last mile" transports Internet services to houses and businesses. The most cost-effective way to increase the reach of the "middle mile" is through enhancing connections to community anchor institutions. Community anchor institutions are typically municipal libraries and Town offices, hospitals and schools, emergency services and public safety operations, and large businesses that have the means and capacity to access broadband-based services. The majority of home and small business users rely on the last mile hosts, Internet service providers (ISPs), to obtain broadband services.[9]



Source: http://www.whitehouse.gov/sites/default/files/20091217-recovery-act-investments-broadband.pdf

There are many different broadband delivery technologies. These technologies can be separated into two major categories of wired and wireless broadband. Wired technologies include Digital Subscriber Lines (DSL), Cable Modem, Fiber Optics, Leased Lines (T1), and Broadband over Powerline (BPL), a

[8] "Broadband: As defined by the NH Broadband Mapping and Planning Program," *New Hampshire Broadband Mapping and Planning Program*, February 15, 2012, http://iwantbroadbandnh.com/planning-and-assistance. (accessed July 17, 2013).
[9] State of New Hampshire, Department of Resources and Economic Development and The Telecommunications Advisory Board, State of New Hampshire Broadband Action Plan: Appendix A, 2008, http://www.nheconomy.com/uploads/Broadband-Action-Plan-Appendices.pdf . (accessed July 17, 2013).

technology that has not been widely adopted locally in NH. Wireless technologies include mobile wireless (3G, 4G, LTE, WiMax), Wi-Fi, satellite, and Wireless Internet Service Providers (WISP).[10] Many end users make use of a blend of wired and wireless delivery technologies. Wired broadband technologies can bring a wire connection to the home or business. Often, a Wi-Fi router is used by the subscriber to share the Internet connection wirelessly among different devices within the home or business, such as a laptop computer or tablet.

Digital Subscriber Lines (DSL) and Cable Modem are wired technologies commonly used by residential and small businesses. DSL uses copper phone lines to deliver direct, one-on-one connections to the Internet, allowing users to not have to share bandwidth with neighbors. Users must be located within 18,000 feet (3.4 miles) of a phone company's central office, which means service is often unavailable in rural areas.[11] The most common DSL connections are asymmetric, with networks offering more bandwidth and faster speeds for download compared to upload, since residential users predominately are downloading more information from the Internet than uploading. Symmetric types of DSL provide equal bandwidth for uploading and downloading speeds, which is sometimes marketed as "Business DSL" as companies often have greater needs for uploading, or transmitting data.

Cable Modem, which is typically faster than a common, asymmetric DSL connection, uses the cable network to deliver broadband to users. Cable networks are a shared connection, so speeds can slow during peak usage times due to congestion when people in the same neighborhood are online. Fiber optic systems use lasers across very thin strands of glass creating reliable, resilient technology that has an extremely high capacity for speeds and data transmission. There is a high cost associated with laying out the fiber network but once in place the system can be easily upgraded and maintained, with lower operating costs than DSL, cable, or wireless networks.[12] Building out the fiber network is currently the most effective means to provide the highest capacity broadband Internet.

As noted above, wireless broadband is available through many technologies. Unlike wired technologies, which bring wires directly to a location, wireless technologies use radio frequencies through transmitters and receivers to deliver broadband. Wireless broadband can be delivered as wireless networks or satellite. Cell phones, and other mobile devices, use mobile wireless licensed technologies such as 3G, 4G, LTE, WiMax, and other networks. Wi-Fi or 'hotspots' are designed to broadcast the Internet for several hundred feet. They are used by public and private networks, including businesses for their employees or retailers for their customers, who connect to the Internet using built-in Wi-Fi cards in their mobile devices (e.g. laptops, tablets, or cell phones, etc).

Wireless Internet Service Providers (WISP) are designed to cover large areas using point-to-multipoint networks to broadcast wireless data up to 20 miles. A signal is broadcast from a base station and is received by a fixed wireless antenna mounted on a customer's premises. A combination of a Wi-Fi Hotspot and a WISP can enable a Neighborhood Internet Service Provider (NISP) or a Wi-Fi Hotzone. A Wi-Fi Hotzone can cover an area such as a neighborhood, shopping mall, or campground.[13] WISP

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[10] "Wireless Internet 101," *Institute for Local Self-Reliance*, http://www.ilsr.org/content-types/fact-sheets-resource-archive/?contenttype=fact-sheets-resource-archive&initiative=broadband. (accessed June 2013).
[11] Shuffstall, Bill, Monica Babine, and Andy Lewis, "Connecting Communities," *The National e-Commerce Extension Initiative*, http://www.connectingcommunities.info/. (accessed July 2013).
[12] "*Broadband 101," Institute for Self-Reliance,* http://www.ilsr.org/content-types/fact-sheets-resource-archive/?contenttype=fact-sheets-resource-archive&initiative=broadband. (accessed on July 17, 2013).
[13] Shuffstall, Bill, Monica Babine, and Andy Lewis, "Connecting Communities," *The National e-Commerce Extension Initiative*, http://www.connectingcommunities.info/. (accessed July 2013).

networks can provide "last mile" solutions and broadband availability to rural areas where it is often cost-prohibitive to build wired networks.

Satellite Internet users send and receive information, via small dishes installed on their premises, using a satellite in space which retransmits the signal to a network operation center that is connected to the Internet. Satellite-based Internet service connections can be interrupted by objects and weather, and broadband upload speeds are typically slower than wired or other wireless networks.[14]

While wireless broadband can offer mobility and access for rural locations, wireless connections are unlikely to overtake the wired network in all areas. Wired networks are likely to maintain higher speeds and lower costs, especially if/when a ubiquitous fiber network is developed. Wireless and wired broadband networks complement each other to create available broadband Internet connections.

Why Broadband Is Important

Broadband is in 2014 what electricity was to New Hampshire in the 1930's - a necessity. As a predominantly rural state, the availability of high-speed Internet is one of the most significant factors that will impact the ability of communities to achieve economic growth and maintain quality of life. In a relatively short period of time, fast and reliable broadband has become essential for economic and community development and is critical infrastructure for public safety, education, health care, business and government operations.[15]

Communities today face many challenges: a competitive global marketplace; an aging population; the need for a better-educated and better-prepared workforce; and, access to health care. These issues are magnified in rural areas as the distance between households and services makes it difficult to access certain resources and opportunities. The financial resources traditionally available to overcome these challenges are often unavailable to rural communities and regions. New solutions are required. Broadband can help community leaders find innovative solutions to these challenges.

There is no doubt that we live in an information society, and broadband connects us to opportunities and services. Whether this is training for a new skill, a new language, or completing an online course - broadband facilitates the access of information in many different forms.[16] In 2010, it was estimated that there were almost 200 million Americans with access to broadband at home, up from 8 million in 2000.[17] While this is an impressive increase, there are still many Americans with insufficient access to broadband services. In New Hampshire, access varies from good coverage and availability in denser areas of the state to areas of un-served and under-served communities in the northern, western and eastern parts of the state. This variability can lead to disparities in economic opportunity, education, community vitality, public health and safety, and quality of life.

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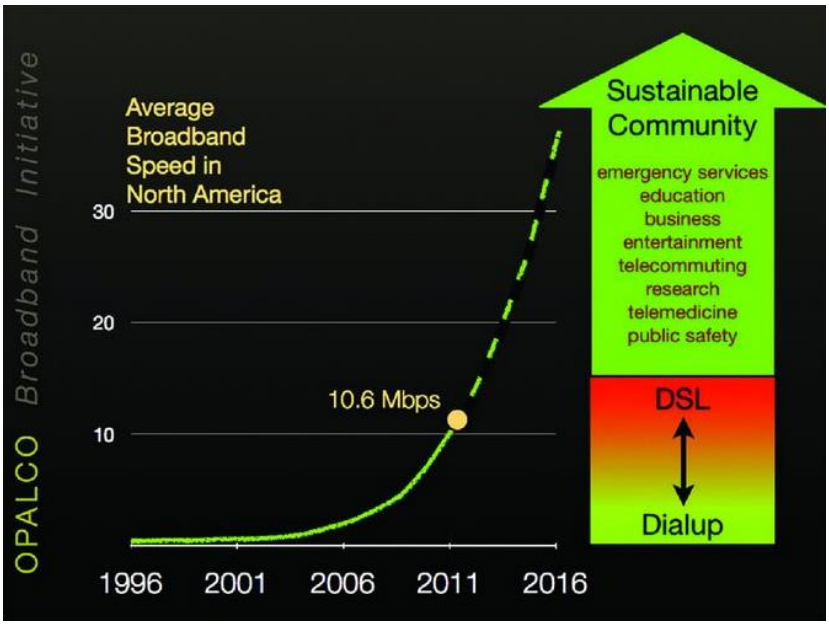
[14] Shuffstall, Bill, Monica Babine, and Andy Lewis, "Connecting Communities," *The National e-Commerce Extension Initiative*, http://www.connectingcommunities.info/. (accessed July 2013).
[15] "Building Community Capacity through Broadband (BCCB) Initiative," *University of Wisconsin Extension*, November 2010, http://www.uwex.edu/broadband/documents/BCCBUWEXFAQ_rev_11_18_10withmap.pdf. (accessed June 2013).
[16] David Salway, "Why is Increasing Broadband Adoption so Important to Society?," *About.com Guide*, http://broadband.about.com/od/barrierstoadoption/a/Why-Is-Increasing-Broadband-Adoption-So-Important-To-Society.htm. (accessed July 2013).
[17] Federal Communications Commission, *Connecting America: The National Broadband Plan*, 2010, http://www.broadband.gov/plan/11-education/#_edn16. (accessed July 17, 2013).



Source: http://www.opalco.com/broadband/do-we-really-need-faster-internet-service-2013-05-01/

Education Sector

Broadband breaks down traditional barriers so that teaching and learning happen in new ways. It's an important tool that can enhance access to and improve the quality of education at all levels in New Hampshire and beyond. Broadband-enabled teaching and learning has the potential to extend learning beyond the limits of the classroom, provide more customized learning opportunities, and increase the efficiency of school systems. [18] The availability of a wide range of Internet based resources such as distance learning programs, online learning modules, and digital textbooks allows students to engage in multimedia lessons, take virtual trips, and communicate with classrooms in other parts of the world. These tools offer educators a platform to share curricula and provide adult learners easy access to professional development or educational opportunities online.

However, as teaching and broadband technology become increasingly intertwined, students lacking access to adequate broadband both in school and at home will be unable to keep up with educational trends and potentially, be less prepared than their peers in more 'connected' areas. The State Educational Technology Directors Association recommends that K-12 schools have access to broadband speeds of 100 megabits per second for every 1,000 students and staff by the year 2014 and 1 gigabyte per second by 2017.[19] Although most schools provide some level of Internet access, too often the speeds of these connections fall short of what is considered appropriate or necessary.[20] This need for improved broadband connections in schools will only increase over time; especially, as educators

[18] Federal Communications Commission, *Connecting America: The National Broadband Plan*, 2010, http://www.broadband.gov/plan/11-education/#_edn16. (accessed July 17, 2013); United National Educational, Scientific, and Cultural Organization, Technology, *Broadband and Education: Advancing the education for all agenda*, Jan. 2013, http://unesdoc.unesco.org/images/0021/002196/219687e.pdf. (accessed July 17, 2013).

[19] C. Fox, J. Walters, G. Fletcher and D. Levin, "The Broadband Imperative: Recommendations to Address K-12 Education Infrastructure Needs," *State Education Directors Technology Association*, 2012, http://www.setda.org/web/guest/broadbandimperative. (accessed July 17, 2013).

[20] C. Fox, J. Walters, G. Fletcher and D. Levin, "The Broadband Imperative: Recommendations to Address K-12 Education Infrastructure Needs," *State Education Directors Technology Association*, 2012, http://www.setda.org/web/guest/broadbandimperative. (accessed July 17, 2013).

transition to web-based content and resources. New Hampshire, along with 24 other states will be implementing the Smarter Balanced Assessment standardized test in 2015, which is completely online. In many communities, school districts provide student report cards to families online only, for three out of four quarters each year.

Access to broadband Internet at home is imperative for adult learners who are looking to retrain in new fields and earn advanced degrees. For New Hampshire to continue having a well-trained, well-educated labor force to meet the demands of a changing economy and business environment, residents need access to fast, high-capacity broadband to access educational opportunities remotely. Online education programs offers flexibility which allows adult learners to continue working while pursuing additional education for the next opportunity.

Not only does the availability of reliable broadband technology offer advances in education, it is imperative to the economic welfare and long-term success of our state and nation.[21] Participation and competition in the global economy is increasingly dependent on twenty-first century skills, including the ability to effectively use technology and navigate the digital world.[22] Providing access to learning opportunities that address these skills can help empower citizens to actively engage in an increasingly technology-driven and digital culture.

Health Sector

With increasing and changing health needs, ranging from accessing health insurance through the Affordable Care Act, to controlling rising health care costs, to managing chronic illnesses, to meeting the needs of an aging population, and a shortage of specialists in rural locations, broadband Internet plays an important role in how these issues are addressed. Many emerging technologies and approaches to health care are dependent on broadband connections to improve health care outcomes while also controlling costs and extending the reach of health care providers.[23] Individual patients, providers, and the overall public health of a community benefit from more efficient, innovative, and informed health care systems as new technologies are adopted.

Telehealth, the broader term incorporating telemedicine, is the transfer of electronic medical data (images, sounds, live video and patient records) from one location to another. It includes the use of electronic information and telecommunications technologies to support long distance clinical care, patient and professional health related education, public health, and health administration.[24] New Hampshire, with rural geography, scarcity of local specialty medical services, and high percentage of

[21] Federal Communications Commission, *Connecting America: The National Broadband Plan*, 2010, http://www.broadband.gov/plan/11-education/#_edn16. (accessed July 17, 2013).
[22] Charles M. Davidson and Michael J. Santorelli, *The Impact of Broadband on Education*, A Report to the U.S. Chamber of Commerce, Dec. 2010, http://www.uschamber.com/sites/default/files/about/US_Chamber_Paper_on_Broadband_and_Education.pdf. (accessed July 2013).
[23] Federal Communications Commission, *Connecting America: The National Broadband Plan*, 2010, http://www.broadband.gov/plan/11-education/#_edn16. (accessed July 17, 2013).
[24] Louis Kazal Jr. and Anne Conner, "Planning and Implementing a Statewide Telehealth Program in New Hampshire", 2005, http://www.endowmentforhealth.org/uploads/documents/resource-center/Planning%20and%20Implementing%20a%20Statewide%20Telehealth%20Program%20in%20NH.pdf

elderly residents, can benefit from telehealth systems.[25] Broadband Internet is necessary to continue supporting current and emerging telehealth applications for patients, providers, hospitals, and health care businesses. According to the 2013 report by Surescripts on e-Prescribing, New Hampshire ranks 9th in the nation in the Safe-Rx Rankings measured by Surescripts based on progress advancing healthcare safety, efficiency and quality through the adoption and use of e-prescribing.[26] New Hampshire was one of five states in 2012 to have greater than 90% of physicians using electronic prescription routing.[27]

Electronic medical records systems enable providers to compile more comprehensive patient records and to collaborate in patient care by accessing treatment information and test results from different locations. Patients can have better access to their medical records and information in an effort to better engage patients and families in managing their health. Video conferencing allows physicians to conduct video consultation and monitor treatment of patients remotely. It also increases the reach of specialized physicians and research.[28] Broadband Internet connection plays an essential role in the ability to incorporate the latest health technologies that benefit patients, health providers, and health industry businesses, leading to cost-saving efficiencies, improved healthcare and better outcomes.

Community Support / Government Sector

From connecting community to members with basic needs in times of need, to providing land use information for developers, community support organizations and local governments in New Hampshire deliver a wide variety of valuable services. Demands for services and information are constantly increasing, yet organizational budgets rarely follow that same trend. Broadband connectivity provides the capacity to more efficiently and cost-effectively deliver information and services while also opening up possibilities for new services and facilitating more robust public participation.

Undoubtedly, certain matters will always be best handled through face-to-face contact, and technology should augment New Hampshire's tradition of accessibility to the public process. But citizens have come to desire, and sometimes expect, a certain level of online interactivity with government and community support organizations. Most municipalities in New Hampshire currently host websites providing immediate, remote access to public notices, event calendars, minutes of meetings, applications, forms, ordinances and regulations. While constituents benefit from easy access to the information they need, governments and community support organizations save time, money and resources when routine requests are handled online.

Equal in value to the administrative efficiencies associated with broadband technology are the accessibility opportunities broadband creates. Online surveys, blogs and other modules offer new ways for a larger percentage of the population to watch and participate in community decision-making processes. Similarly, technologies utilized by community support organizations now enable them to administer one-on-one services without travelling.

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[25] Louis Kazal Jr. and Anne Conner, "Planning and Implementing a Statewide Telehealth Program in New Hampshire", 2005, http://www.endowmentforhealth.org/uploads/documents/resource-center/Planning%20and%20Implementing%20a%20Statewide%20Telehealth%20Program%20in%20NH.pdf

[26] Surescripts, The National Progress Report on E-Prescribing and Safe-Rx Rankings, 2013, http://surescripts.com/news-center/national-progress-report-2013

[27] Surescripts, The National Progress Report on E-Prescribing and Safe-Rx Rankings, 2012, http://surescripts.com/docs/default-source/national-progress-reports/national-progress-report-on-e-prescribing-year-2012.pdf

[28] Federal Communications Commission, *Connecting America: The National Broadband Plan*, 2010, http://www.broadband.gov/plan/11-education/#_edn16. (accessed July 17, 2013).

While new applications allowing for improved public sector and community support organization interaction and transparency will continually surface, the need to perpetually maintain broadband infrastructure will remain a constant.

Public Safety Sector

New Hampshire is a predominantly rural state, where firefighters, law enforcement and emergency medical personnel cover wide geographic areas. These public safety officials are often required to quickly make potentially life-saving decisions in the field, despite the challenges of rugged terrain and natural and man-made disasters. Public safety personnel need the ability to quickly communicate with each other, access online resources (via a PC or mobile device), connect to networks, and quickly transfer important video and data files during emergencies. Broadband access through a combination of wired and wireless technologies can enhance public safety by enabling first responders to make informed decisions and allowing them to communicate with one another effectively, usually resulting in reduced loss of life and property. For example, some schools in New Hampshire are equipped with security cameras enabling police, en route to a school emergency, to view video feeds in real time, to arrive at the scene informed of the location and status of the emergency situation.

Economic Development/Business

Jobs depending on broadband and information and communications technology will grow by 25% between 2008 and 2018 or at a rate of 2.5% faster than the average for other occupations and industries.[29] To say that broadband technology has not changed the way we do business is to deny the tremendous impact that computers have had on our lives worldwide. In 2011, 73% of New Hampshire households and businesses had access to broadband and, nationally in 2012, 66% of adults have broadband at home, which is up from 3% in 2000.[30] Investment in broadband is showing benefits for small businesses and local economies, as well. A Connect Iowa study of the state's small businesses found that Iowa small businesses generate $1.9 billion in online sales and that small businesses with a broadband connection have revenues that are $200,000 higher annually than those which do not.[31]

Broadband and broadband-dependent applications allow small businesses to increase efficiency, improve market access, reduce costs and increase the speed of both transactions and interactions. By using Web-based technology tools, 68% of businesses surveyed boosted the speed of their access to knowledge, 54% saw reduced communications costs and 52% saw increased marketing effectiveness.[32] The use of broadband by small businesses has proven to be an efficient and cost effective tool. Business statistics have shown that small businesses have consistently been the backbone for job and wealth creation in the US economy. The use of broadband has truly served to enrich that position into the 21st century.

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[29] Federal Communications Commission, *Connecting America: The National Broadband Plan*, 2010, http://www.broadband.gov/plan/11-education/#_edn16. (accessed July 17, 2013).

[30] The Pew Internet and American Life Project, Sept. 2012, available at http://www.pewinternet.org/.

[31] Anna Read and Damon Poter, "Building High-Speed Communities," *APA Planning Magazine*, March 2013.

[32] Federal Communications Commission, *Connecting America: The National Broadband Plan*, 2010, http://www.broadband.gov/plan/11-education/#_edn16. (accessed July 17, 2013).

Broadband has a major economic impact in New Hampshire. Businesses are more profitable as they access expanded markets and information. Home businesses and teleworking are now viable in many areas, and new jobs are created as a result of expanding broadband. Robust broadband infrastructure would foster economic development; and healthy economic development will in turn fuel additional broadband deployment. The use of broadband for economic development improves the ability to retain and recruit businesses, increases business profitability, attracts highly skilled workers, improves the efficiency of municipal services, enhances access to healthcare, and contributes to stronger educational attainment. All are key ingredients to a successful economic development strategy.

APPENDIX D – NEW HAMPSHIRE'S BROADBAND MAPPING PROGRAM AND REGIONAL BROADBAND MAPS

NEW HAMPSHIRE BROADBAND MAPPING AND PLANNING PROGRAM

The New Hampshire Broadband Mapping & Planning Program (NHBMPP) was funded through the Department of Commerce's National Telecommunications and Information Administration (NTIA) State Broadband Initiative (SBI), formerly known as the State Broadband Data Development (SBDD) program. In 2010, grants were issued to each of the 50 states, 5 territories and the District of Columbia to compile and maintain a mapped inventory of broadband availability at the state level. The state data sets are regularly submitted to the NTIA for incorporation in the national broadband map, thereby contributing to national, regional, and state efforts to understand the current broadband landscape and to plan for future broadband expansion, access, and adoption.

Broadband Availability

The NHBMPP began mapping statewide broadband availability in January of 2010, with data collection and processing scheduled at 6-month intervals throughout the project end date of December 2014. All map data development is governed by NTIA guidelines and standards, which are enforced to accommodate the merging and analysis of data from NH with comparable data sets from the other 55 grantees.

The first NHBMPP mapping task was to generate a listing of the active Internet service providers (ISPs) in the state. An initial list of approximately 70 ISPs was compiled from existing plans and documents as well as local knowledge. The list was continually reviewed and updated as required, and was finished with over 60 known active providers.

At the start of each biannual map update, NHBMPP staff contacted each active ISP and requested broadband service coverage information. The data requested by the NHBMPP comprised the footprint of the provider coverage area(s), the technology delivering service to that footprint, and the advertised download and upload data transmission speeds for the footprint. Per NTIA guidelines, the footprint represents both areas that are currently served and areas that could be served within 10 business days.

NHBMPP focused on building strong relationships with providers, and actively encouraged the provision of data by accommodating data submissions in a variety of forms, and provided technical support to facilitate submission when requested. The coverage data received by the NHBMPP arrived in formats ranging from detailed maps with speed information to customer addresses to highlighted paper maps to full digital databases that align with the national broadband map format.

The ISP data submissions were processed by the NHBMPP, standardized to conform to NTIA programmatic requirements, verified with the providers, and submitted to NTIA during the spring and fall of each year. Key details of the data processing and standardization included:

- Wireline broadband technology (cable, DSL, T-1, fiber) data are processed into the NTIA standardized format of US Census blocks for areas where the blocks are less than two square miles, and US Census road centerlines for rural areas where the census blocks are greater than two square miles. (The US Census data are derived from the 2010 TIGER files.) If a provider indicates than an address within a Census block or along a road segment is served, the entire

block or road is considered served. This may result in an overstatement of coverage footprints in some areas of the state.

- Coverage footprints may also appear to be overstated due to the fact that some providers are submitting data on residential and business class services combined, without differentiating between the two classes. This means that the speed associated with a given census block may reflect the high-speed services delivered to businesses within that block rather than typical speeds available to residential customers. This is more likely to result in an overstatement of speed tiers achievable than it is an overstatement of the coverage footprint itself.

- Wireless broadband technology (cellular, fixed-wireless, satellite) data are processed to represent the actual region that the signal covers. For cellular and satellite providers, the provider submission to NHBMPP is typically the coverage footprint. For fixed wireless, the submission typically comprises the tower location and height, and associated antenna details (make, model, power, signal direction, and span). The NHBMPP then utilizes specialized software (Cellular Expert) to process these inputs and to generate a signal propagation model describing the coverage area.

- Providers are submitting maximum advertised download and upload streams to the NHBMPP, as per NTIA guidance. The NHBMPP recognizes that these may be higher than actual speeds experienced by consumers. However, the NHBMPP verification efforts detailed below, and specifically the collection of speed test records, helps to mitigate this issue.

- The NHBMPP invites participation from all providers. However, not all ISPs have opted to submit data in each data collection cycle. This may result in an understatement of coverage footprints for some areas and some technologies.

While the NHBMPP was required to process the coverage information in the aggregated format, each state had the opportunity to advance and enhance the level of mapping locally. The NHBMPP collected a suite of complementary data in order to verify the service information supplied by the ISPs. These included user speed tests submitted to the project website (www.iwantbroadbandnh.org), broadband use and availability surveys also submitted to the project web site and/or collected at project meetings, and direct email feedback. The program also conducted a number of technology-focused verification inventories, including the following:

- Statewide drive test to collect cellular service data. In the summer of 2012, every US interstate and state route in New Hampshire was driven and each of the 5 cellular provider networks was tested for a data signal using signal propagation software on a provider cell phone.

- Town verification maps to provide feedback on the wireline technologies service areas (DSL and cable). In the summer/fall of 2013, paper maps were provided to each of the 234 cities/towns in the state, requesting that community members with knowledge of the broadband landscape review and submit corrections to the NHBMPP, as appropriate.

Where any of these verification methods indicated that service may not be available in an area reported as served, that area is marked for additional inquiry. Direct contact with the appropriate provider was made to confirm that the mapped data was correct based on project standards. If the finding is that the

block was appropriately mapped but there are interior service gaps, the census block (or road segment) was flagged as being partially served. In some cases, broadband service to NH residents was offered or improved based on these reports and direct provider feedback.

Community Anchor Institutions

Broadband connectivity information for New Hampshire's 4,000+ Community Anchor Institutions (CAIs), including schools, libraries, municipalities, hospitals, and public safety entities, was collected on the same biannual schedule as the broadband coverage data. At the project outset, the nine regional planning commissions (RPCs) compiled listings of each CAI in their jurisdiction, mapped their location, and conducted phone and email surveys with each institution. Since that time, the broadband connectivity information collected was updated and maintained every 6 months through utilization of a web based reporting tool, as well as direct contact by the RPCs to the CAIs. As recently reported by NTIA, the data have been used by policymakers, researchers and other stakeholders, as well as the Network NH Now broadband expansion project, in planning for broadband expansion in NH and nationally.

Data Management

All of the data collected as part of the inventory and verification process was managed in a geographic information system (GIS), which allows for extensive data analysis and reporting. These data are analyzed in concert with other spatial data available in the GRANIT database in order to identify areas of the state that are served, unserved, and underserved. Due to the ever-changing speed requirements of online applications, areas of New Hampshire that are designated as underserved are subject to ongoing review.

The data collected by the NHBMPP and its partners are available in multiple venues. Key data sets of broad interest may be downloaded through the GRANIT web site (www.granit.unh.edu). Other data may be requested directly from the NHBMPP (contact@iwantbroadbandnh.org). In addition, the basic broadband availability data and the CAI inventory are available for online viewing through an interactive map hosted on the NHBMPP website (www.iwantbroadbandnh.org).

Through direct provider contact as well as community engagement and feedback, the NHBMPP was able to generate the most accurate and comprehensive broadband inventory available to date. Additionally, this engagement increased the dialogue between stakeholders on resolving issues around broadband availability, accessibility and adoption.

However, the NHBMPP recognized that in some cases, broadband access and adoption is more a matter of affordability than one of availability. While pricing information was not currently being inventoried, steps have been taken to collect these data and efforts will continue in the future.

In addition to the coverage data currently being collected, rural address points were inventoried across the state, and are publically available to support more granular level mapping in the future. These data may be used to inventory specific addresses for their broadband availability in order to pinpoint those areas of the state with no service or where service is limited. Collecting the speed tests at the address level also yielded a higher resolution of mapping in order to identify the gaps in service in the census block.

The Future of Mapping Broadband in NH

At the conclusion of the NTIA-funded program in 2014, responsibility for national broadband availability mapping will transfer to the Federal Communications Commission (FCC). Currently, there is a federal requirement for Internet service providers to submit to the FCC their service information at the US Census tract level. Starting in 2015, the FCC requirement will change to reflect the US Census block level geography that has been used by the NHBMPP and its counterparts around the country.

The NHBMPP aims to continue this important broadband inventorying effort. One key data stream that is of interest is the collection of speed test data, as this represents actual speeds experienced by users around the state. These data may then be used to enhance the census block information collected by the FCC, to indicate the areas in which actual transmission speeds experienced by users are lower than those reported by providers.

BROADBAND MAPS

The NHBMPP collected data on broadband availability, speeds, costs, types, as well as other information by collecting data directly from the providers. This data is displayed in the following series of maps.

The broadband data was mapped by US Census block, which provided a fairly high-resolution picture of broadband availability in the state and in the Central NH Region. The drawback of aggregating data to census blocks is that may over-represent coverage and quality of coverage especially in large area census blocks. If any single address within a census block has broadband service at any given higher speed, the entire block showed as being covered at that speed. There have been attempts to mitigate this misrepresentation of service including surveys and map exercises. Some of the blocks that are partially covered but have reported gaps are identified as such in some of these maps. Another consideration is that there are a very small number of providers who declined to participate in the NHBMPP, and their coverage is not represented.

Map 1: Degree of Competition of Broadband Availability
The Degree of Competition map shows the number of broadband providers that service at least a portion of any given census block. The highest number of broadband providers are available in and near downtown Concord, parts of Bow, Hopkinton, Pembroke, Chichester, and Loudon, with seven or more providers for many census blocks. The northern and western portions of the region have the fewest number of providers, with one to four providers being more typical. Note that data are aggregated to the block level, so not all portions of any given census block will have access to each of the providers shown. Satellite broadband is excluded from this map.

Map 2: Broadband Availability as Reported Through the NHBMPP Online Speed Test
In addition to broadband speeds, the NHBMPP speed test also requested Internet provider information. The following map shows the Internet providers of those who participated in the NHBMPP online survey. The map shows much of the central portion of the region including the Concord area to be predominantly served by Comcast Cable and Comcast Business Communications, while the northern and western portion of the region is primarily served by TDS. Several other providers appear locally and in smaller numbers.

Map 3: Broadband Availability as Reported Through the NHBMPP Online Speed Test
The following maps show broadband availability as reported through the NHBMPP online speed test. The NHBMPP promoted the availability of an online speed test tool through its website, which had the dual benefit of educating broadband users of their delivered download and upload speeds, and also provided the NHBMPP information on broadband connectivity in the region. Residents who submitted speed test entered their location information, Internet provider, and other information. Survey participants from the Concord area were shown to have the highest speeds, generally in excess of 6 Mbps download, while much of the western and northwestern portion of the region recorded slower speeds within the 1-3 Mbps download range. This map displays data collected through September 30th 2014, totaling 282 entries.

Map 4: Broadband Availability by Maximum Advertised Download Speed
The highest download speeds in the region were found to be above 1 Gbps largely due to recent expansion of fiber and improved cable service in some areas. These speeds are available in at least part of nearly half of the CNHRPC municipalities. An exception are the southwestern communities, where maximum speeds are around 100 Mbps or less in most areas. Advertised speeds are typically higher than the actual delivered speeds, which can vary. Data are aggregated to the census block level, the highest speed available at any point in a given census block shows as the maximum speed available for the entire block. Satellite broadband is excluded from this map.

Map 5: Level of Service for Broadband Intensive Applications and Uses
The Level of Service map attempts to show how well existing broadband service meets various broadband needs. The map designates census blocks as served, underserved, or unserved, and also shows census blocks where gaps in broadband availability have been reported. Areas in green show census blocks that are served, defined as having an advertised download speed greater than 6 Mbps and upload speed of 1.5 Mbps. Because data are conglomerated at the block level, if any portion of a census block is served, the entire block is shown as served. Areas in purple represent census blocks that meet the 768 kbps definition of broadband, but have a download speed of 6 Mbps or less. This category recognizes that while some areas meet the federal definition of broadband, the speeds are too slow to meet many needs. Yellow areas denote census blocks that have no broadband coverage. Since data is conglomerated to the census block level, an effort to show census blocks that have only partial coverage has been made by identifying census blocks where gaps in broadband service have been reported. These can be seen in the darker shades of green or purple.

Map 6: Broadband Availability for Uses That Require High Speed
This map displays census blocks where broadband was found to be available at high speeds, defined as an advertised download speed of greater than 10 Mbps and an upload speed greater than 6 Mbps. High speeds allow for a wide range of broadband applications. The northern and western portions of the region do not have access to broadband at these speeds, including much of Bradford, Warner, Sutton, Webster, and Salisbury, along with scattered areas across the region. These areas are limited in their applications for broadband because of the lower speeds. Most other town center areas including Concord are covered at a high speed. Data are aggregated to the census block level, if any portion of a census block has access to high speeds, the entire block shows as having high speeds. Satellite broadband is excluded from this map.

Map 7: Broadband Availability for Uses that Require Moderate Speed
This map displays census blocks where broadband was found to be available at moderate speeds, defined as an advertised download speed of greater than 3 Mbps and an upload speed greater than 1.5 Mbps. Moderate speeds allow for a reasonable range of broadband applications. The northern and western portions of the region do not have access to broadband at these speeds, including much of Bradford, Warner, Sutton, Webster, and Salisbury, along with scattered areas across the region. Pittsfield, along with parts of Epsom and Allenstown also do not have access to broadband at these speeds in the western portion of the region. These areas are limited in their applications for broadband because of the lower speeds. Most other communities including Concord, Bow, Chichester, Loudon, Canterbury, Boscawen, and Hopkinton are covered at a moderate speed. Data are aggregated to the census block level, if any portion of a census block has access to moderate speeds, the entire block shows as having high speeds. Satellite broadband is excluded from this map.

Map 8: Broadband Availability at Community Anchor Institutions
This map shows broadband availability by the type of Community Anchor Institutions (CAIs). Common CAIs include K-12 schools, libraries, medical/health care centers, public safety centers, University/Colleges, and other governmental and non-governmental locations. Throughout the region, a trend of no or unknown access through medical and health care centers as CAIs can be seen, especially in downtown areas such as Concord. There are also locations of no or unknown availability through libraries as CAIs. These can be seen in Concord, Dunbarton, Deering, and Salisbury. Satellite broadband is excluded from this map.

Map 9: Satellite Broadband Service
The Satellite Broadband Service map displays the locations of where satellite broadband service was found to be available. As shown in the map, Satellite Broadband Service is available to all communities in the region with zero spots of service not available, shown in white. Data are aggregated to the census block level, if any portion of a census block has access to satellite broadband service, the entire block shows as having access to satellite broadband service.

Map 10: Broadband Technology with Maximum Advertised Download Speed
Map 10 shows the technology available delivering the maximum advertised download speed. The northwest portion of the region has the largest variation of technologies, with DSL, Terrestrial Mobile Wireless, and Optical Carrier/Fiber to the End User covering areas of Bradford, Warner, Sutton, Webster, Salisbury, and Boscawen. The map shows the remaining areas of the region as having cable as the technology delivering the maximum advertised download speed, with areas of terrestrial Mobile Wireless and Optical Carrier/Fiber to the End User through-out. Data are aggregated to the census block level, if any portion of a census block has access to a technology with the maximum advertised download speed, the entire block shows as having access to that technology with that advertised download speed. Additionally, in cases where two or more broadband technologies had the same maximum advertised download speed for a census block, the technology assigned was consistent with the order displayed in the legend. Satellite broadband is excluded from this map.

Map 11: Broadband Availability
The map displays broadband availability based on provider advertised speeds throughout the region, categorizing areas as served, underserved, unserved, or unpopulated areas. Served was defined as a maximum download and upload speed of at least 6 and 1.5 Mbps. Unserved defined as a download and upload speed less than 768 and 200 Kbps, and Underserved ranging in-between the two. The northwest portion of the region is a mixture of areas served and underserved, including the communities of

Bradford, Warner, Sutton, Webster, and Salisbury. The remaining of the region seems to be served, with portions of underserved scattered throughout. Additionally, there are portions of unserved in Sutton, Salisbury, Sutton and Allenstown. Data are aggregated to the census block level, if any portion of a census block is served, the entire block is shown as served. Satellite and cellular broadband is excluded from this map.

Map 12: Wireline versus Terrestrial Wireless Service Availability

The map of wireline versus terrestrial wireless service availability shows broadband availability based on wireline and wireless provider advertised speeds. The maps displays all extents of the region having wireline and wireless service available. Data are aggregated to the census block level, if any portion of a census block is served, the entire block is shown as served. Satellite broadband is excluded from this map.

NEW HAMPSHIRE broadband MAPPING & PLANNING PROGRAM

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Central NH Regional Planning Commission

Degree of Competition for Broadband Availability

This map displays broadband availability based on data submitted to the NH Broadband Mapping & Planning Program as of **March 31, 2013**.

Number of Broadband Providers

- 1 Broadband Provider Offers Service
- 2
- 3
- 4
- 5
- 6 Broadband Providers Offer Service
- 7
- 8
- 9
- 10
- 11
- 12 Broadband Providers Offer Service

Map Notes:

The federal guidelines for this project define broadband as access that is at least **768 kbps downstream** and **200 kbps upstream**.

Service providers submitted data to the NH Broadband Mapping & Planning Program (NHBMPP) in a range of geographies, including addresses, road segments, census blocks, census tracts, etc. For mapping purposes, all data are aggregated and displayed at the census block level. A census block is mapped as "served" if service is delivered to any part of the block.

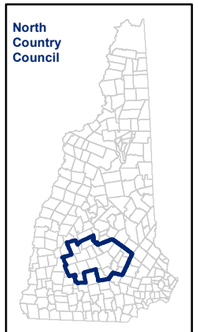
Note that satellite internet is excluded from this analysis and display.

The GRANIT System at the University of New Hampshire is responsible for the management of the inventory and conducts updates to these data every 6 months.

N

0 0.5 1 2 3 4 Miles

North Country Council



www.cnhrpc.org

NH GRANIT
www.granit.unh.edu

University of New Hampshire
www.unh.edu

The New Hampshire Broadband Mapping and Planning Program is funded under grant #33-50-M09048 from the US Dept. of Commerce to the University of New Hampshire.

Map Date: October 2013

GRANIT, USGS

NEW HAMPSHIRE broadband MAPPING & PLANNING PROGRAM

iwantbroadbandnh.org

Central New Hampshire Regional Planning Commission

Broadband Availability as Reported Through the NHBMPP Online Speed Test

This map displays broadband availability based on data submitted to the NH Broadband Mapping & Planning Program as of **September 30, 2014**.

Legend

Broadband Providers from Speed Test Results

- Comcast Cable
- Comcast Business Communications
- TDS Telecom
- State of New Hampshire Department of Health and Hu
- Fairpoint Communications
- Verizon Wireless
- MetroCast Cablevision
- Wireless Data Service Provider Corporation
- Wildblue Communications
- Granite State Long Distance
- AT&T Services
- America Online
- Hughes Network Systems
- Metro2000
- University of New Hampshire
- Ad-Base Systems Inc. (DBA GlobalPOPS)
- AT&T Wireless
- Community College System of New Hampshire
- Juno Online Services
- One Communications Corporation
- Sprint PCS
- Verizon Business
- WorldPath Internet Services

Map Notes:
The speed test data were created from results of an online speed test and survey as of September 2014.

The inventory is updated every 6 months using the NHBMPP CAI web portal. The GRANIT System at the University of New Hampshire is responsible for the overall management of the inventory, with the nine regional planning commissions providing ongoing technical support.

N

0 0.5 1 2 3 4 Miles

Central New Hampshire Regional Planning Commission

www.cnrpc.org

NH GRANIT
www.granit.unh.edu

University of New Hampshire
www.unh.edu

The New Hampshire Broadband Mapping & Planning Program is funded under grant #33-50-M09048 from the US Dept. of Commerce to the University of New Hampshire.

Map Date: September 2013

Springfield
Danbury
Hill
Webster Lake
Sanbornton
Lake Winnisquam
Gilford
Winnipesaukee, Lake
Wilmot
New London
Andover
Tilton
Belmont
Alton
Pleasant Lake
Sunapee
Lake Sunapee
Franklin
Northfield
Gilmanton
Salisbury
Canterbury
Barnstead
Sutton
Newbury
Loudon
Boscawen
Webster
Warner
Pittsfield
Strafford
Chichester
Goshen
Bradford
Northwood
Washington
Hopkinton
Concord
Epsom
Northwood Lake
Henniker
Pembroke
Hillsborough
Allenstown
Deerfield
Windsor
Stoddard
Bow
Dunbarton
Weare
Hooksett
Deering
Candia
Antrim
Goffstown
Bennington
Francestown
New Boston
Auburn
Raymond
Hancock
Manchester
Nelson
Massabesic Lake
Chester

GRANIT, USGS

NEW HAMPSHIRE broadband MAPPING & PLANNING PROGRAM

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Central New Hampshire Regional Planning Commission

Broadband Availability as Reported Through the NHBMPP Online Speed Test

This map displays broadband availability based on data submitted to the NH Broadband Mapping & Planning Program as of **September 30, 2014**.

Broadband Speeds (mbps)

- <1
- 1-3
- 3-6
- 6-8
- 8-18
- >18

Map Notes:

The speed test data were created from results of an online speed test and survey as of September 2014.

The inventory is updated every 6 months using the NHBMPP CAI web portal. The GRANIT System at the University of New Hampshire is responsible for the overall management of the inventory, with the nine regional planning commissions providing ongoing technical support.

N

0 0.5 1 2 3 4 Miles

Central New Hampshire Regional Planning Commission

www.cnhrpc.org

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University of New Hampshire www.unh.edu

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Map Date: September 2013

Springfield
Danbury
Hill
Webster Lake
Sanbornton
Lake Winnisquam
Gilford
Winnipesaukee, Lake
Wilmot
Tilton
Belmont
Alton
New London
Andover
Pleasant Lake
Sunapee
Lake Sunapee
Northfield
Gilmanton
Franklin
Salisbury
Sutton
Canterbury
Barnstead
Newbury
Loudon
Boscawen
Webster
Warner
Pittsfield
Strafford
Chichester
Goshen
Bradford
Northwood
Northwood Lake
Epsom
Washington
Hopkinton
Concord
Henniker
Pembroke
Hillsborough
Allenstown
Deerfield
Windsor
Stoddard
Bow
Dunbarton
Weare
Hooksett
Deering
Candia
Antrim
Goffstown
Bennington
Francestown
New Boston
Auburn
Raymond
Hancock
Manchester
Massabesic Lake
Nelson
GRANIT, USGS

NEW HAMPSHIRE broadband MAPPING & PLANNING PROGRAM

iwantbroadbandnh.org

Central NH Regional Planning Commission

Broadband Availability by Maximum Advertised Download Speed

This map displays broadband availability based on data submitted to the NH Broadband Mapping & Planning Program as of **September 30, 2014**.

Maximum Advertised Download Speed Available

- >= 768 Kbps and < 1.5 Mbps
- >= 1.5 Mbps and < 3 Mbps
- >= 3 Mbps and < 6 Mbps
- >= 6 Mbps and < 10 Mbps
- >= 10 Mbps and < 25 Mbps
- >= 25 Mbps and < 50 Mbps
- >= 50 Mbps and < 100 Mbps
- >= 100 Mbps and < 1 Gbps
- >= 1 Gbps

Map Notes:

The federal guidelines for this project define broadband as access that is at least **768 kbps downstream** and **200 kbps upstream**.

Service providers submitted data to the NH Broadband Mapping & Planning Program (NHBMPP) in a range of geographies, including addresses, road segments, census blocks, census tracts, etc. For mapping purposes, all data are aggregated and displayed at the census block level. A census block is mapped as "served" if service is delivered to any part of the block.

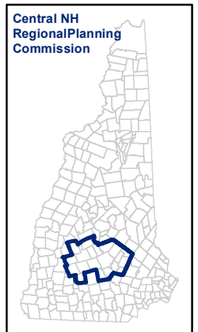
Note that satellite internet is excluded from this analysis and display.

The GRANIT System at the University of New Hampshire is responsible for the management of the inventory and conducts updates to these data every 6 months.

N

0 0.5 1 2 3 4 5 Miles

Central NH RegionalPlanning Commission



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Map Date: September 2013

GRANIT, USGS

NEW HAMPSHIRE broadband MAPPING & PLANNING PROGRAM

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Central New Hampshire Regional Planning Commission

Level of Service for Broadband Intensive Applications and Uses

This map displays broadband availability based on data submitted to the NH Broadband Mapping & Planning Program as of **September 30, 2014**.

Level of Service Based on Provider Advertised Speeds

Served	*Maximum Advertised Download Speed: 6+ Mbps* *Maximum Advertised Upload Speed: 1.5+ Mbps*
Served With Reported Gaps	
Underserved	*Maximum Advertised Download Speed: 768 kbps - 6 Mbps* *Maximum Advertised Upload Speed: 200 kbps - 1.5+ Mbps*
Underserved With Reported Gaps	
Unserved	*Maximum Advertised Download Speed: < 768 kbps* *Maximum Advertised Upload Speed: < 200 kbps*
Unpopulated Areas	

Broadband intensive applications and uses are those that require a minimum of 6 Mbps downstream and 1.5 Mbps upstream to be fully functional. These may include: streaming HD content, connecting 5+ internet devices, video conferencing, etc.

SERVED:
Maximum Advertised Download Speed: 6+ Mbps
Maximum Advertised Upload Speed: 1.5+ Mbps

UNDERSERVED:
Maximum Advertised Download Speed: 768 kbps - 6 Mbps
Maximum Advertised Upload Speed: 200 kbps - 1.5+ Mbps

UNSERVED:
Maximum Advertised Download Speed: < 768 kbps
Maximum Advertised Upload Speed: < 200 kbps

REPORTED GAPS are areas where the NHBMPP has received user emails or website surveys indicating that no service is available. Additionally, areas where speed tests have been filed that do not meet the minimum speed criteria are flagged as having a gap in service.

Map Notes:
Service providers submitted data to the NH Broadband Mapping & Planning Program (NHBMPP) in a range of geographies, including addresses, road segments, census blocks, census tracts, etc. For mapping purposes, all data are aggregated and displayed at the census block level. A census block is mapped as "served" if service is delivered to any part of the block.

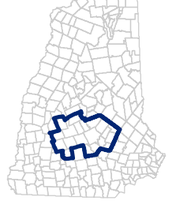
Note that satellite internet is excluded from this analysis and display.

The GRANIT System at the University of New Hampshire is responsible for the management of the inventory and conducts updates to these data every 6 months.

N

0 0.5 1 2 3 4 Miles

Central New Hampshire Regional Planning Commission



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The New Hampshire Broadband Mapping & Planning Program is funded under grant #33-50-M09048 from the US Dept. of Commerce to the University of New Hampshire.

Map Date: September 2013

NEW HAMPSHIRE broadband MAPPING & PLANNING PROGRAM

iwantbroadbandnh.org

Central NH Regional Planning Commission

Broadband Availability for Uses that Require High Speed*

This map displays broadband availability based on data submitted to the NH Broadband Mapping & Planning Program as of **September 30, 2014**.

Broadband Availability at High Transmission Speeds

- Service Available
- Service Not Available

*High speed broadband defined as:
Advertised Download Speed: Greater Than 10 Mbps
Advertised Upload Speed: Greater Than 6 Mbps

Uses that require high speed broadband:
- Sending/receiving large files and small to medium-sized databases
- HD quality, codec-based, large frame videoconferencing; multiple (bridged) sites/users
- Remote synchronous education, professional development, workshops, etc., facilitated simultaneously at multiple classrooms and/or other locations
- Telehealth/telemedicine applications
- High speed end to end network and business to business applications
- Telemetry-based applications (rely critically on the ability of broadband to continuously monitor and multiplex data, i.e. remote patient monitoring, sensing systems, etc.)
- "Internet 2" connectivity and applications

Map Notes:

Service providers submitted data to the NH Broadband Mapping & Planning Program (NHBMPP) in a range of geographies, including addresses, road segments, census blocks, census tracts, etc. For mapping purposes, all data are aggregated and displayed at the census block level. A census block is mapped as "served" if service is delivered to any part of the block.

Note that satellite internet is excluded from this analysis and display.

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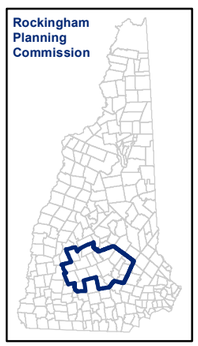

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Map Date: September 2013

NEW HAMPSHIRE broadband MAPPING & PLANNING PROGRAM

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Central NH Regional Planning Commission

Broadband Availability for Uses that Require Moderate Speed*

This map displays broadband availability based on data submitted to the NH Broadband Mapping & Planning Program as of **September 30, 2014**.

Broadband Availability at Moderate Transmission Speeds

- Service Available
- Service Not Available

*Moderate broadband speed is defined as:
Advertised Download Speed: 3 Mbps - 6 Mbps
Advertised Upload Speed: 1.5 Mbps - 3 Mbps

Uses that require a minimum of moderate speed broadband:

- Medium to high social media use
- Sending/Receiving medium to large-sized documents or files (photos, word processing)
- Streaming SD content; buffering not a concern; downloading High Definition (HD) content (movies, video) speed a concern
- 3-5 internet devices possible
- VPN access needed, speed of operation important but not critical to job function
- Multiple functions performing simultaneously required (e.g. web browsing, streaming video/music, downloading content), but not concerned with potential slowness of downloads
- Low quality, small window frame videoconferencing (Skype)
- Cloud-based computing and data storage

Map Notes:

Service providers submitted data to the NH Broadband Mapping & Planning Program (NHBMPP) in a range of geographies, including addresses, road segments, census blocks, census tracts, etc. For mapping purposes, all data are aggregated and displayed at the census block level. A census block is mapped as "served" if service is delivered to any part of the block.

Note that satellite internet is excluded from this analysis and display.

The GRANIT System at the University of New Hampshire is responsible for the management of the inventory and conducts updates to these data every 6 months.

Rockingham Planning Commission

N

0 0.5 1 2 3 4 Miles

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Map Date: September 2013

GRANIT, USGS

NEW HAMPSHIRE broadband MAPPING & PLANNING PROGRAM

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Central New Hampshire Regional Planning Commission

Broadband Availability at Community Anchor Institutions

This map displays broadband availability based on data submitted to the NH Broadband Mapping & Planning Program as of **September 30, 2014**.

Broadband Availability by CAI Type

K-12 School
- Yes
- No/Unknown

University/College
- Yes
- No/Unknown

Library
- Yes
- No/Unknown

Other Community - Governmental
- Yes
- No/Unknown

Medical/Health Care
- Yes
- No/Unknown

Other Community - Non-Governmental
- Yes
- No/Unknown

Public Safety
- Yes
- No/Unknown

Map Notes:

The federal guidelines for this project define broadband as access that is at least **768 kbps downstream** and **200 kbps upstream**.

Note that satellite internet is excluded from this analysis and display.

The Community Anchor Institution (CAI) inventory includes records for over 4,000 institutions in the state. The inventory was initiated in the spring of 2010 by contacting each institution to establish their baseline broadband availability profile. Mapping was accomplished by the nine regional planning commissions.

The inventory is updated every 6 months using the NHBMPP CAI web portal. The GRANIT System at the University of New Hampshire is responsible for the overall management of the inventory, with the nine regional planning commissions providing ongoing technical support.

N

0 0.5 1 2 3 4 Miles

Central New Hampshire Regional Planning Commission

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Map Date: September 2013

GRANIT, USGS

NEW HAMPSHIRE broadband MAPPING & PLANNING PROGRAM

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Central New Hampshire Regional Planning Commission

Satellite Broadband Service

This map displays broadband availability based on data submitted to the NH Broadband Mapping & Planning Program as of **September 30, 2013**.

Satellite Broadband Availability

- Service Available
- Service Not Available

Map Notes:

Service providers submitted data to the NH Broadband Mapping & Planning Program (NHBMPP) in a range of geographies, including addresses, road segments, census blocks, census tracts, etc. For mapping purposes, all data are aggregated and displayed at the census block level. A census block is mapped as "served" if service is delivered to any part of the block.

The GRANIT System at the University of New Hampshire is responsible for the management of the inventory and conducts updates to these data every 6 months.

N

0 0.5 1 2 3 4 Miles

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Map Date: September 2013

Springfield
Danbury
Hill
Webster Lake
Sanbornton
Lake Winnisquam
Gilford
Winnipesaukee, Lake
Winnipesaukee, Lake
Wilmot
New London
Andover
Tilton
Belmont
Alton
Pleasant Lake
Sunapee
Lake Sunapee
Northfield
Gilmanton
Franklin
Salisbury
Sutton
Canterbury
Barnstead
Newbury
Loudon
Boscawen
Webster
Pittsfield
Strafford
Warner
Chichester
Goshen
Bradford
Northwood
Epsom
Northwood Lake
Washington
Hopkinton
Concord
Henniker
Pembroke
Hillsborough
Allenstown
Windsor
Stoddard
Bow
Deerfield
Dunbarton
Weare
Hooksett
Deering
Candia
Antrim
Goffstown
Bennington
Francestown
New Boston
Raymond
Auburn
Hancock
Manchester
Massabesic Lake
Nelson
Chester
GRANIT, USGS

NEW HAMPSHIRE broadband MAPPING & PLANNING PROGRAM

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Central NH Regional Planning Commission

Broadband Technology with Maximum Advertised Download Speed

This map displays broadband availability based on data submitted to the NH Broadband Mapping & Planning Program as of **September 30, 2014**.

Technology Delivering Maximum Advertised Download Speed

- DSL
- Cable
- Terrestrial Fixed Wireless
- Terrestrial Mobile Wireless
- Other (T-1, etc.)
- Optical Carrier/Fiber to the End User

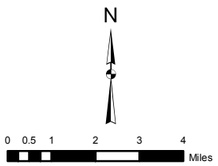
Map Notes:

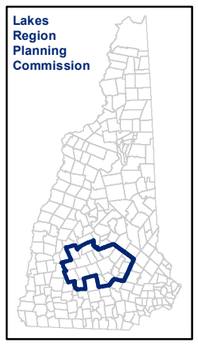
The federal guidelines for this project define broadband as access that is at least **768 kbps downstream** and **200 kbps upstream**.

Service providers submitted data to the NH Broadband Mapping & Planning Program (NHBMPP) in a range of geographies, including addresses, road segments, census blocks, census tracts, etc. For mapping purposes, all data are aggregated and displayed at the census block level. A census block is mapped as "served" if service is delivered to any part of the block.

In some cases, two or more broadband technologies had the same maximum advertised download speed for a given census block. When this occurred, the technology assigned was consistent with the order displayed in the legend (i.e. where DSL and Cable had the same advertised speed, DSL was assigned). Note also that satellite internet is excluded from this analysis and display.

The GRANIT System at the University of New Hampshire is responsible for the management of the inventory and conducts updates to these data every 6 months.





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Map Date: September 2013

GRANIT, USGS

NEW HAMPSHIRE broadband MAPPING & PLANNING PROGRAM

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Central NH Regional Planning Commission

Broadband Availability

This map displays broadband availability based on data submitted to the NH Broadband Mapping & Planning Program as of **September 30, 2014**.

Availability Based On Provider Advertised Speeds

- Served
- Underserved
- Unserved
- Unpopulated Areas

The federal guidelines for this project define broadband as access that is at least 768 kbps downstream and 200 kbps upstream. The NHBMPPhas adopted a higher threshold for minimum broadband transmission speeds as described below.

SERVED:
Maximum Advertised Download Speed: 6+ Mbps
Maximum Advertised Upload Speed: 1.5+ Mbps

UNDERSERVED:
Maximum Advertised Download Speed: 768 Kbps - 6 Mbps
Maximum Advertised Upload Speed: 200 Kbps - 1.5+ Mbps

UNSERVED:
Maximum Advertised Download Speed: < 768 Kbps
Maximum Advertised Upload Speed: < 200 Kbps

Map Notes:
Service providers submitted data to the NH Broadband Mapping & Planning Program (NHBMPP) in a range of geographies, including addresses, road segments, census blocks, census tracts, etc. For mapping purposes, all data are aggregated and displayed at the census block level. A census block is mapped as "served" if service is delivered to any part of the block.

Note that satellite and cellular internet are excluded from this analysis and display.

The GRANIT System at the University of New Hampshire is responsible for the management of the inventory and conducts updates to these data every 6 months.

N

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Southern New Hampshire Planning Commission

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Map Date: September 2013

Grantham
Springfield
Sunapee
New London
Wilmot
Danbury
Hill
Andover
Franklin
Webster Lake
Pleasant Lake
Lake Sunapee
Salisbury
Sutton
Newbury
Warner
Goshen
Bradford
Washington
Hillsborough
Henniker
Windsor
Highland Lake
Stoddard
Deering
Antrim
Bennington
Francestown
Nelson
Sunapee Lake
Hancock
Greenfield
Webster
Sanbornton
Tilton
Lake Winnisquam
Laconia
Gilford
Belmont
Alton
Winnipesaukee, Lake
Northfield
Gilmanton
Canterbury
Barnstead
Loudon
Pittsfield
Strafford
Chichester
Epsom
Northwood
Northwood Lake
Concord
Hopkinton
Pembroke
Allenstown
Deerfield
Nottingham
Bow
Dunbarton
Weare
Hooksett
Candia
Goffstown
New Boston
Manchester
Auburn
Raymond
Massabesic Lake
Chester
Bedford
Bow Lake
Bow Lake
Bow Lake
GRANIT, USGS

NEW HAMPSHIRE broadband MAPPING & PLANNING PROGRAM

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Cenral NH Regional Planning Commission

Wireline Versus Terrestrial Wireless Service Availability

This map displays broadband availability based on data submitted to the NH Broadband Mapping & Planning Program as of **March 31, 2014**.

Broadband Availability Based On Provider Advertised Speeds

- Wireline Service Available
- Wireless Service Available

Map Notes:

The federal guidelines for this project define broadband as access that is at least **768 kbps downstream** and **200 kbps upstream**.

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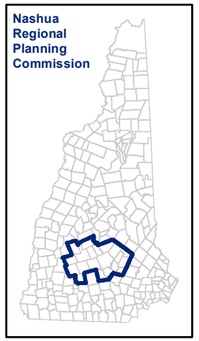
Note that satellite internet is excluded from this analysis and display.

The GRANIT System at the University of New Hampshire is responsible for the management of the inventory and conducts updates to these data every 6 months.

Nashua Regional Planning Commission



N

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Map Date: September 2013

Grantham
Springfield
Danbury
Hill
Wilmot
New London
Andover
Franklin
Webster Lake
Sanbornton
Laconia
Gilford
Lake Winnisquam
Lake Winnipesaukee
Belmont
Alton
Tilton
Gilmanton
Pleasant Lake
Sunapee
Lake Sunapee
Northfield
Salisbury
Barnstead
Canterbury
Boscawen
Loudon
Sutton
Newbury
Webster
Goshen
Warner
Pittsfield
Strafford
Chichester
Bow Lake
Bradford
Concord
Northwood
Epsom
Hopkinton
Washington
Henniker
Pembroke
Hillsborough
Allenstown
Deerfield
Highland Lake
Windsor
Bow
Nottingham
Weare
Dunbarton
Stoddard
Deering
Hooksett
Antrim
Candia
Goffstown
Manchester
Raymond
Bennington
Francestown
New Boston
Auburn
Nelson
Nubanusit Lake
Hancock
Massabesic Lake
Chester
Greenfield
Bedford