

The Strafford Regional Broadband Plan

Local Solutions for the Strafford Region

Adopted January 2015

Authors:

Shayna Sylvia
Matt Sullivan
Colin Lentz
Sarah McGraw



An abstract graphic design featuring a central vertical band of dark blue and red, with numerous thin, curved lines radiating outwards from it, creating a sense of motion and connectivity. The lines are primarily blue and red, with some white highlights, and they curve downwards and outwards, resembling a stylized network or a dynamic flow.

Regional Broadband Plan

Strafford
Regional
Planning
Commission

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Colin Lentz

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Preface

This plan is the work of Strafford Regional Planning Commission staff. However, this work could not be completed without the efforts of many partners, including the University of New Hampshire, Cooperative Extension, GRANIT, the nine Regional Planning Commissions, and numerous volunteers. Throughout this process Strafford Regional Planning Commission has engaged a wide array of individuals and groups as part of its public involvement process.

Through the New Hampshire Broadband Mapping and Planning Program's webpage (www.iwantbroadbandnh.org) the project was able to engage partner organizations and citizens on a statewide basis. This plan is scheduled for completion on June 30th, 2014, but this effort does not end there. Stakeholder groups will continue to have an arena for public comment through the program website, as well as through their voices as consumers and citizens.

Strafford Regional Planning Commission would like to acknowledge the following individuals and organizations for their dedicated time and efforts that aided in the process of analyzing existing broadband conditions in the region, identifying broadband uses, needs, barriers, and goals, and lending their expertise to help SRPC staff create a strategic Broadband Plan.



Broadband Stakeholder Group

Caren Rossi
Planning and Zoning Administrator/Assistant EMD
Town of Lee

Mike Hoffman
Building Inspector
Town of Newmarket

Brent Lemire
Town Administrator
Town of Northwood

Lincoln Lavoie
Senior Engineer, Broadband Technologies
UNH Interoperability Lab

Erica Johnson
Director
UNH Interoperability Lab

Rouzbeh Yassini
Executive Director
Broadband Center of Excellence

Rod Bowles
Owner, Terbow Consulting
President of Newmarket Business Association

Hal Kreider
Vice Chair, Economic Development Committee
Town of Northwood

Scott Nemet
Captain, Lee Fire and Rescue
Town of Lee

Rick Lundborn
Chairman
Rochester Economic Development Commission

John LaRochelle
Member
Rochester Economic Development Commission

Ron Poulin
Member
Rochester Economic Development Commission

Mary Jo Monusky
Board of Directors
Rochester Chamber of Commerce

Susan DeRoy
Member
Rochester Economic Development Commission

Janet Davis
Secretary
Rochester Economic Development Commission

Karen Pollard
Deputy City Manager, CEDS Member
City of Rochester

Michael Provost
Executive Director
Rochester Main Street

Elaine Lauterborn
Councilor
City of Rochester

Kevin Ryan
Member
Rochester Economic Development Commission

Alan Reed Erickson
Councilor
City of Rochester

Tom Mullen
City Assessor
City of Rochester

Robert Jaffin
Commissioner, CEDS Member
Strafford Regional Planning Commission

T.J. Jean
Mayor
City of Rochester

Ute Luxem
Assistant Vice President Commercial Lending, CEDS
Member
Profile Bank

Dan Barufaldi
Economic Development Director, CEDS Member
City of Dover

Luke Vincent
IT Director
Town of Durham

Sector Based Interviews

Sandy Pardus
Chief Information Officer/Chief Financial Officer
Lamprey Healthcare in Newmarket

Josh Lauer
Assistant Professor of Communications
University of New Hampshire

Shawn Linscott
Technology Director at Frisbie Hospital

Ken Fifield
Chief of police
Town of Wakefield

Luke Vincent
IT Director
Town of Durham

Caren Rossi
Planning and Zoning Administrator/Assistant EMD
Town of Lee

Scott Nemet
Captain, Lee Fire and Rescue
Town of Lee

Bob Jaffin
Commissioner
Strafford Regional Planning Commission

Strafford Regional Planning Commission Staff

A number of Strafford Regional Planning Commission Staff were involved in the preparation of the Regional Broadband Plan, in multiple capacities, during the 5-year duration of the project. Executive Director Cynthia Copeland, AICP, has been responsible for project management and development while serving as the coordination lead between SRPC and state, regional, and local partners. Matt Sullivan has served as the regional Project Manager of the New Hampshire Broadband Mapping and Planning Program, coordinating data collection and analysis, GIS mapping, community outreach and engagement, reporting functions, and plan drafting and preparation. Shayna Sylvia and Colin Lentz provided support via public relations mediums, coordinating public outreach efforts, performing data collection, as well assisting in the writing, drafting, and formatting of this document. Dan Camara and Kyle Pimental provided technical assistance in data collection and GIS mapping project elements. Marilyn Barton assisted with grant management and data collection tasks in addition to serving as the projects HR Specialist.

In addition, we would like to thank both our regional communities, as well as the Strafford Regional Planning Commissioners, for their continued dedication and support throughout the length of this process.

Our staff members:

Administration

Cynthia Copeland, AICP
Executive Director

Marilyn Barton, PHR
Human Resources Specialist/Events Coordinator

Planning

Matthew Sullivan
Regional Planner

Shayna Sylvia
Community Outreach Intern

Colin Lentz
Planner

Kyle Pimental
Regional Planner

Dan Camara
Senior GIS/Transportation Analyst

Communities

Town of Barrington

Town of Brookfield

City of Dover

Town of Durham

Town of Farmington

Town of Lee

Town of Madbury

Town of Middleton

Town of Milton

Town of New Durham

Town of Newmarket

Town of Northwood

Town of Nottingham

City of Rochester

Town of Rollinsford

City of Somersworth

Town of Strafford

Town of Wakefield



Executive Summary

Broadband internet access is a powerful tool that is fast becoming as vital as electricity. The term broadband (or “high-speed internet”) refers to several technologies that rapidly transmit large amounts of detailed data and information through wires or wirelessly between two points and throughout a network. Representing a substantial improvement over legacy technologies (e.g. dial-up), broadband supports a wide range of services, including: higher quality voice communications (e.g. digital telephone service); creating and viewing rich graphic media (e.g. interactive news websites with pictures, text, and video); and networking facilities for sharing important, detailed information. Broadband has the potential to improve economics, public health and safety, governance, and education at the local level and throughout the Strafford region.

This regional plan comes from a statewide effort – The New Hampshire Broadband Mapping and Planning Program (NHBMPP) – to understand the current extent of broadband access, identify the opportunities and benefits it offers to communities, and consider significant barriers to its expansion. NHBMPP efforts are the result of collaboration among state agencies, the University of New Hampshire, and the nine regional planning commissions. Thanks to this collaboration the program has followed a comprehensive approach including: inventory and mapping of existing broadband availability; numerous planning and technical assistance initiatives; and building capacity for local, regional, and state level implementation.

Data from surveys, mapping, interviews, and stakeholder engagement provide a detailed picture of the challenges, opportunities, and needs centered around broadband in the Strafford region. Each of the region’s 18 communities has areas where broadband access is limited or non-existent, but rural communities in the north and west (much of the total land area) have far less access than the well-developed cities near the seacoast. Currently, none of these communities addresses broadband expansion in their master plans. The Strafford region currently has the highest population growth in the State of New Hampshire, and projections predict continued growth for the next few decades.ⁱ Broadband may prove critical to the effective growth and development of individual communities as more people move to take advantage of the region’s rural character, beautiful natural resources, and business opportunities. Survey results suggest that effective broadband planning may depend on working with community anchor institutions – such as local public health and safety facilities, schools, and businesses – rather than individual residences for expanding internet access.

Individual communities and the whole region stand to benefit from improving access to broadband technology. Its expansive capabilities can advance healthcare, education, public safety, local government, and economic development. Planning efforts will have to address several challenges before implementation can proceed. Among these are the rural nature of much of the region, limited local economies, the high initial costs for broadband technology, and low competition between current internet service providers.

Implementation of broadband will require collaboration among local, regional, and state-level stakeholders. Currently in its early stages, planning and implementation will likely take a top-down + bottom-up approach. Initial focus will be on outreach and education at the municipal level, as well as building a legal framework through state-level enabling legislation. Strategies for building capacity include data collection, developing factsheets and other promotional material, creating local-regional partnerships, and incorporating broadband planning in local and regional master plans.

Introduction



Project Background

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

NHBMPP is managed by the GRANIT (Geographically Referenced Analysis and Information Transfer) System within the Earth Systems Research Center at the University of New Hampshire (UNH), and is a collaboration of statewide partners. These include 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).



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Program Components & Objectives

The NHBMPP is comprised of several components, including a broadband availability inventory and mapping effort and a suite of planning and technical assistance initiatives. The 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;

- 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.



Technical Assistance and Training

University of New Hampshire Cooperative Extension (UNHCE) has taken 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 NHBMP, include:

- Assessing the technical needs of stakeholder groups including educational institutions, small businesses, local governments and nonprofits through the 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

Planning

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

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 have 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 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,

Capacity Building

A third component of the NHBMP is focused on the development of tools and resources necessary to implement broadband projects within communities and regions across the state. This component offers continued support for the Director of Broadband Technology, which is a position established within the NH Department of Resource and Economic Development to coordinate and provide 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

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 NHBMP, and to receive feedback from community members regarding broadband availability.

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 to

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 to be compiled into a statewide broadband planning document by the New Hampshire Office of Energy and Planning.



Understanding Broadband



What is Broadband?

Broadband, also called 'high-speed Internet,' is the umbrella term referring to Internet access that is always on and is significantly faster than dial-up Internet access. The National Telecommunications and Information Administration (NTIA) defines broadband 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."ⁱⁱ 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). NTIA defines broadband as providing a minimum speed of 768 Kbps download and 200 Kbps upload. Most broadband technologies have different downloading and uploading speeds, with upload speed typically being more limited. As technology and applications continually change, there are many different types of broadband services as well as resulting speeds and functions while using the Internet.

Although NTIA defines broadband at a 768 Kbps minimum download threshold, download speeds up to 3 Mbps have 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 company's network 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 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.ⁱⁱⁱ As Internet technology and applications continuously emerge and evolve it takes much more than the minimum broadband threshold to operate successful businesses, and provide relevant education and quality medical care.

The New Hampshire Broadband Mapping and Planning Program (NHBMPP) developed a matrix to assist stakeholders in understanding the many levels of broadband available in the state of New Hampshire 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 has established broadband availability categories ("un-served," "underserved," and "served") to describe access to broadband service. The table below is a condensed version of the NHBMPP matrix.

Exhibit 1- Speed Tiers and Functions/Use

Tiers of Service	Download Speed	Upload Speed	Typical Functions / Use <i>(functions additive to level above)</i>
un-served	< 768 Kbps	< 200 Kbps	Email (client/served-based)
underserved	768 Kbps to < 1.5 Mbps	200 Kbps to < 768 Kbps	Web-based email Limited web browsing Send/receive small documents not concerned with speed of download/upload Single user Internet device
	1.5 Mbps to < 3 Mbps	768 Kbps to <1.5 Mbps	Medium social media use Send/Receive medium-size documents/files Limited streaming content, buffering a concern 1-3 simultaneous Internet devices possible
served	3 Mbps to <6 Mbps	1.5 Mbps to <3 Mbps	Send/Receive medium to large-size documents or files Streaming content, downloading High Definition (HD) content, speed a concern Low quality, small window videoconferencing
	6 Mbps to <10 Mbps	3 Mbps to 6 Mbps	Send/Receive large documents or files (small videos) Streaming HD Virtual Private Network (VPN) access for remote work at speed critical to job function Multi-player online gaming
	10 Mbps to <25 Mbps	6 Mbps to <10 Mbps	HD quality, large frame videoconferencing Remote synchronous education, professional development facilitated simultaneously at multiple locations Tele-health applications possible
	25+ Mbps	10+ Mbps	Send/Receive medium to large databases Real-time HD medical imaging and consultation, remote patient monitoring

Source: New Hampshire Broadband Mapping and Planning Program <http://www.iwantbroadbandnh.org>



How It Works

Broadband infrastructure consists of the Internet “backbone” which 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. In order to transport the Internet to homes and businesses, known as the “last mile,” it can be most cost-effective to increase the reach of the “middle mile” through 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.^{iv}

There are many different broadband delivery technologies. These technologies can be separated into two major categories: wired and wireless broadband. Wired technologies include Digital Subscriber Lines (DSL), Cable Modem, Fiber Optics, Leased Lines (T1), and Broadband over Powerline (BPL). Wireless technologies include mobile wireless (3G, 4G, LTE, WiMax), Wi-Fi, satellite, and Wireless Internet Service Providers (WISP).^v Wired broadband technologies 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, 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.^{vi} 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



Exhibit 2- Broadband Recovery Investments

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

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 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. Building out the fiber network is currently the most effective means to provide the highest capacity broadband Internet.

Wireless broadband is available through many technologies, including mobile wireless (3G, 4G, LTE), Wi-Fi, satellite, and Wireless Internet Service Providers (WISP). 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 categorized 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

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 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.^{vii} WISP 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 the premises to a satellite in space which retransmits the signal to a network operation center that is connected to the Internet. Satellite-based Internet connection can be interrupted by objects and weather, and broadband upload speeds are typically slower than wired or other wireless networks.^{viii} While wireless broadband can offer mobility and access for rural locations, wireless connections are unlikely to overtake the wired network, which is likely to maintain higher speeds and lower costs, especially when compared to a ubiquitous fiber network. Wireless and wired broadband networks can be thought to complement each other to create available broadband Internet connections.^{ix}

Why is Broadband Important?

Broadband is becoming 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 in the ability of communities to achieve economic growth and maintain quality of life. In a relatively short period, fast and reliable broadband has become essential for economic and community development and is critical infrastructure for public safety, education, healthcare, business and government operations.^x

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 healthcare. 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

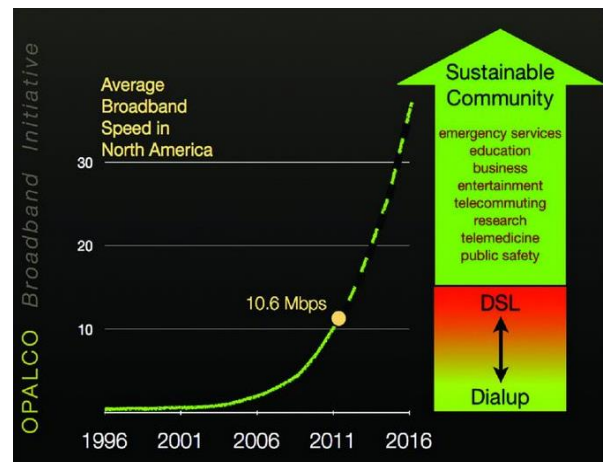


Exhibit 3 – Broadband and Sustainable Communities.

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

rural communities and 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 many opportunities and services. Whether training for a new skill, a new language, or completing an online course - broadband facilitates the access of information in many different forms.^{xi} In 2010, it was estimated that there were almost 200 million Americans with access to broadband at home, up from 8 million in 2000.^{xii} 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.

Broadband Importance by Sector

Education:

Broadband can enhance the quality of education at all levels in New Hampshire. Broadband-enabled teaching and learning has the potential to extend learning beyond the limits of the classroom, provide customized learning opportunities, and increase the efficiency of school systems.^{xiii} It can also increase educational opportunities for a greater range of New Hampshire residents. 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.^{xiv} 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.^{xv} This need for improved broadband connections in schools will only increase over time; especially, as educators transition to web-based content and resources and more states require online assessments and testing.

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.^{xvi} 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.^{xvii} Providing access to learning opportunities that address these skills can help empower students to actively engage in an increasingly technology-driven and digital culture.

Health:

Healthcare is vast and complex, with issues ranging from rising costs, managing chronic illnesses, meeting the needs of an aging population, and a shortage of specialists in rural locations. Broadband Internet plays an important role in addressing these issues. Many emerging medical technologies and approaches are dependent on broadband connections to improve healthcare outcomes while also controlling costs and extending the reach of healthcare providers.^{xviii} Individual patients, providers, and the overall public health of a community benefit from more efficient, innovative, and informed healthcare 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.^{xx} New Hampshire – with its rural

geography, irregular specialty medical services, and high percentage of elderly residents – can benefit from effective telehealth systems.^{xx} Broadband Internet is necessary to continue supporting current and emerging telehealth applications for patients, providers, hospitals, and healthcare businesses.

Electronic medical records systems enable providers to collaborate in patient care by accessing treatment information from different locations. Patients and families who have more access to their medical records and information will be better suited to engage 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.^{xxi} 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.

Community Support / Government:

From providing a displaced community member with food and shelter to organizing community initiatives, local governments and community support organizations in New Hampshire deliver a wide variety of valuable services to their constituents. Broadband connectivity provides the capacity to more efficiently and cost-effectively deliver services while 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 only 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 towns in New Hampshire currently host websites providing immediate, remote access to public notices, event calendars, 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 meetings, 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.

While new applications allowing for improved public sector interaction and transparency will continually surface, their reliance on perpetually maintained broadband infrastructure will remain a constant.

Public Safety:

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.

Economic Development/Business:

The total economic impact of broadband in New Hampshire was estimated at \$634 million in 2010 and in 2011, 11,000 net new jobs were created because of expanded broadband.^{xxii} Broadband and economic development are interconnected; as we progress into the future, both are needed for each to be successful. 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.

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.^{xxiii} 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.^{xxiv} 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.^{xxv}

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.^{xxvi} 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.

Regional Broadband Overview



Regional Broadband Landscape

The Strafford region, along with much of Southeastern New Hampshire, is very well served by broadband infrastructure. However, each of the region's eighteen communities is marked by pockets of un-served/underserved streets or neighborhoods where broadband connectivity is limited, unreliable, or non-existent. SRPC's southern communities, ranging from Newmarket to Rochester, tend to have higher rates of broadband penetration, as well as higher-speed connections. In contrast, those communities to the north, with lower population density and more variable geography, often experience difficulty with broadband access and adequacy.

Our region's broadband-related challenges – while numerous – are often a result of geographic, technological, or administrative barriers related to providing service to consumers in the 'last mile' or final leg from the existing infrastructure to the homes or businesses. As a result, broadband-marginalized populations and entities find themselves behind their well-connected counterparts in the region, state, nation, and globe. Additionally, those who do have access to broadband service, often find that cost

can be extremely high proportionally to income or business revenue. For those not experiencing the challenges associated with high costs and connectivity issues, the unreliability of existing connections, often due to a lack resiliency and redundancy associated with these systems, can be a barrier to implementation.

To continue investigating the technological, administrative, socio-economic, and geographic boundaries related to broadband connectivity in our region, Strafford Regional Planning Commission has and will continue to meet with members of its Broadband Stakeholder Group through 2014. This group has aided in the identification of evolving challenges and solutions in the regional broadband landscape, while serving as the advisory board for the development of this Regional Broadband Plan. Its members include citizens, local government representatives, business owners, emergency responders, elected officials, educators, and even broadband innovators. Members have guided the principles behind the regional vision and goals for broadband.

The State of Broadband Planning

SRPC Planning staff, in the spring of 2013, conducted a regulatory and master plan analysis of the region's eighteen communities. The purpose of this review was to identify telecommunications ordinances, regulations, overlay districts, and references to broadband infrastructure in municipal master plan chapters. The results of this analysis are presented in the table to the right.

Of the eighteen master plans, none include language specifically related to broadband infrastructure, deployment, or adoption and utilization. However, fourteen of eighteen communities reference telecommunications infrastructure in their zoning ordinances, or as part of an overlay district.

We conclude therefore, that broadband planning in the region's municipalities is in its initial stages. Although some communities have incorporated the necessary regulatory components into their zoning documents, they have not yet begun to adopt a vision for broadband. Few communities have a dedicated IT department, capable of or charged with creating a short and long-term plan for infrastructure and adoption. Those that are fortunate enough to have these resources often cannot devote the necessary time to incorporating these projects into their broader community master plans.

The recognition of the importance of broadband to the overall vision of communities is a key goal of this plan. The region should begin integrating broadband infrastructure into its municipal guiding documents as a first step of considering future community growth and development. In the Vision section of this Plan, you will find the regional broadband vision for the Strafford Regional Planning Commission Regional Broadband Plan. Our role in this vision is to encourage our communities in, and foster information sharing related to, the expansion of broadband infrastructure in the region.

Municipality	Zoning Ordinances	Personal Wireless Facilities	Overlay District	Other	Telecommunications Facilities	Master Plan Inclusion
Barrington						
Brookfield						
Dover						
Durham						
Farmington						
Lee						
Madbury						
Middleton						
Milton						
New Durham						
Newmarket						
Northwood						
Nottingham						
Rochester						
Rollinsford						
Somersworth						
Strafford						
Wakefield						

Exhibit 4 – Community Ordinance and Regulation Analysis

Source: SRPC



Vision

As illustrated above, broadband offers the possibility of continued growth and prosperity for each of the Strafford region's communities. However, there is much work to be done, and broadband planning is in its infancy. The vision and goals laid out below suggest a direction forward. The Strafford Regional Broadband Plan Vision was developed by Strafford Regional Planning Commission and the Broadband Stakeholder Group.

Strafford Regional Broadband Plan Vision:

Residents, businesses, and communities in the Strafford region seek to ensure their future prosperity through universal access to and utilization of broadband infrastructure technologies. As a beacon of innovation, powered by advanced technology, manufacturing, and healthcare industries, this region will continue to attract tomorrow's business leaders and visionaries while providing for its residents, a climate for success and prosperity.

By addressing broadband adoption and utilization through strategic planning and implementation efforts, the Strafford Region seeks to mitigate the socio-economic and geographic barriers to adequate access for all residents, businesses, and communities. As a means of bridging the digital divide, broadband access equity will be achieved through the provision of affordable services throughout existing un- and underserved areas in both rural and urban areas.

To ensure broadband infrastructure growth does not create undue taxpayer or consumer burdens, the region will not only build the foundation for funding mechanisms for future improvements, but also promote creative uses of existing infrastructure that are both redundant and resilient. Through the implementation of creative broadband-based applications in the sectors of healthcare, education, public safety, economic development, and local government, our region will emerge as an innovative leader in broadband penetration and utilization.

Goals

Address the digital divide through the implementation of training programs aimed at increased digital literacy and technological adoption amongst un-served and underserved populations

Continue to implement innovative broadband technologies and applications as part of the intelligent transportation system suite of the region's transportation networks

Ensure healthcare, public safety, education, and other Community Anchor Institutions have access to broadband speeds of 100mbps via redundant and resilient networks

Create a statewide communications network for use by all public safety entities in emergency response and disaster preparedness applications

Promote public/private investment in tomorrow's broadband infrastructure, technologies, and applications to ensure the continued economic and social prosperity of the region's citizens

Attract broadband-based business to the region via the creation of focused training programs that increase economic growth and competitiveness through the development of a skilled workforce

Identify and prioritize strategic recommendations, goals, and performance measures over short, medium, and long terms as part of this plan's implementation timeline

Increase access to and transparency of local government through investment in e-government applications that provide valuable information and services to citizens, visitors, and businesses

Regional Overview



Geographic Background

The Strafford region is located in the southeastern part of New Hampshire forming the eastern border of the state. The Salmon Falls River flows south into the Piscataqua River separating Strafford and Carroll Counties from Maine. The region is located equidistant of Metro Boston and Portland, Maine (60 miles). The Lakes region and the White Mountains are directly north; and the seacoast is directly southeast. As a result, Massachusetts has a strong influence on the southern portion of the region, providing employment for thousands of residents of Strafford County.

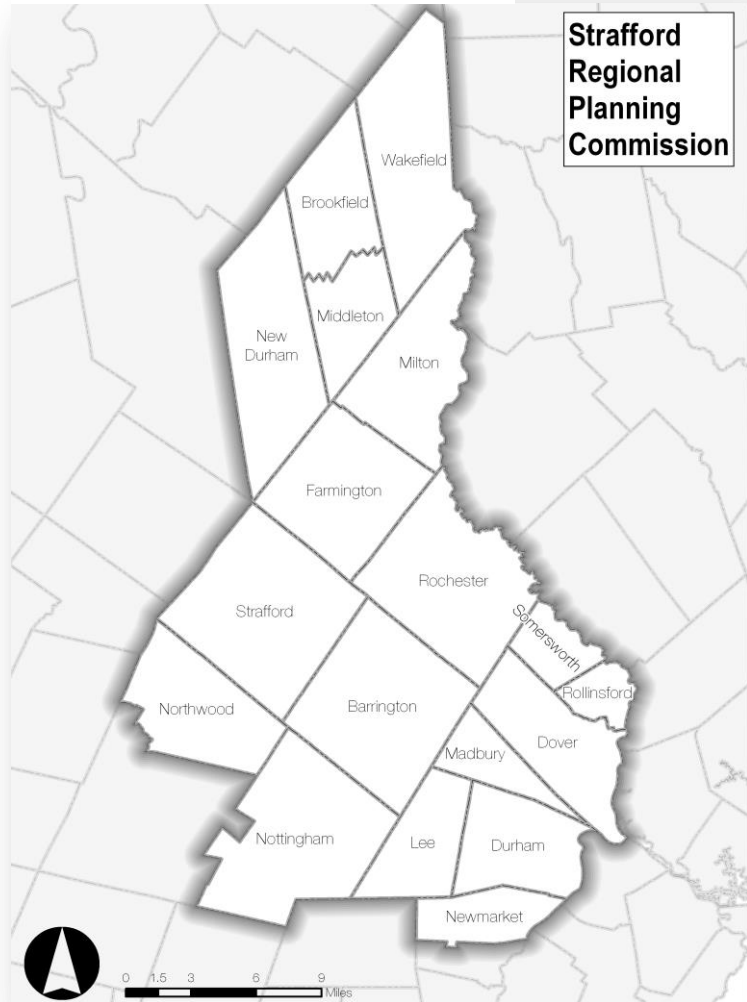
Strafford is a region that is set apart by its beautiful natural resources, diverse communities from urban to rural, and a rich culture, and is the only county in New Hampshire with Tri Cities (Dover, Rochester, and Somersworth). Durham is home to the University of New Hampshire, the flagship entity of the University System of New Hampshire.

The Strafford planning region consists of eighteen communities, from Newmarket in the south, to Wakefield in the north. The region is comprised of all thirteen communities in Strafford County, three communities in Rockingham County, and two in Carrol County.

Most Strafford communities lay within the Piscataqua River Basin. Five coastal rivers pass through the region and converge into the Great Bay, a nationally recognized Estuarine Research Reserve. The Piscataqua River drains the estuary into the Gulf of Maine through Portsmouth Harbor to the east. Rockingham County borders Strafford County to the south, the state of Maine to the northeast, Carroll County to the north, and Belknap and Merrimack Counties to the west.

Exhibit 5 – Strafford Regional Planning Commission Planning Region

Source: SRPC



Population Trends and Projections

The United States is projected to grow to approximately 420 million people by 2060^{xxvi}. The 2010 Census showed that Strafford County was the fastest growing county in the state of New Hampshire, with a percentage increase of 9.7%.^{xxviii} The region's proximity to large population centers, such as Boston, MA and Portland, ME, will continue to influence the region's growth in the future. Growing populations mean opportunities for major economic growth, but the full extent of these opportunities may be missed without taking full advantage of the 21st century connectivity and utility of broadband access. A growing population also means greater need for effective public services that can meet increased demand. Municipal broadband access will link people with the jobs, educational opportunities, businesses, and local government that will bring Strafford region communities into the future. Understanding how regional populations are

changing is critical to planning effectively for that future.

In New Hampshire, Strafford County is the smallest in land area, but is the third highest in population density, resulting in higher potential for low-cost broadband implementation in its communities^{xxx}. As shown in Exhibit 6, the Strafford region's population more than doubled during rapid population growth from the 1950s through 2010. Exhibit 7 shows projected growth into 2040^{xxx}. Current projections shows that the region will continue to experience significant growth, but at a more moderate rate than in the past. The percentage of change of the projected growth from 2010 to 2040 in the region is 12.7%. This, in comparison with the actual growth rate of 52.3 % between 1980 and 2010, depicts this decrease in growth rate.

Exhibit 6 - Strafford Region Population Change 1960-2010

	1960	1970	1980	1990	2000	2010	% Change 00-10
Barrington	1,036	1,865	4,404	6,164	7,475	8,576	14.7%
Brookfield	145	198	385	518	604	712	17.9%
Dover	19,131	20,850	22,377	25,042	26,884	29,987	11.5%
Durham	5,504	8,869	10,652	11,818	12,664	14,638	15.6%
Farmington	3,287	3,588	4,630	5,739	5,774	6,786	17.5%
Lee	931	1,481	2,111	3,729	4,145	4,330	4.5%
Madbury	556	704	987	1,404	1,509	1,771	17.4%
Middleton	349	430	734	1,183	1,440	1,783	23.8%
Milton	1,418	1,859	2,438	3,691	3,910	4,598	17.6%
New Durham	474	583	1,183	1,974	2,220	2,638	18.8%
Newmarket	3,153	3,361	4,290	7,157	8,027	8,936	11.3%
Northwood	1,034	1,526	2,175	3,124	3,640	4,241	16.5%
Nottingham	623	952	1,952	2,939	3,701	4,785	29.3%
Rochester	15,927	17,938	21,560	26,630	28,461	29,752	4.5%
Rollinsford	1,935	2,273	2,319	2,645	2,648	2,527	-4.6%
Somersworth	8,529	9,026	10,350	11,249	11,477	11,766	2.5%
Strafford	722	965	1,663	2,965	3,626	3,991	10.1%
Wakefield	1,223	1,420	2,237	3,057	4,252	5,078	19.4%
Regional Total	65,977	77,888	96,447	121,028	132,457	146,895	10.9%

Source: Census Bureau



Exhibit 7-Projected and Actual Population Growth for Strafford Region
 Source: US Census

Projected and Actual Population Growth Strafford Region 1960-2040

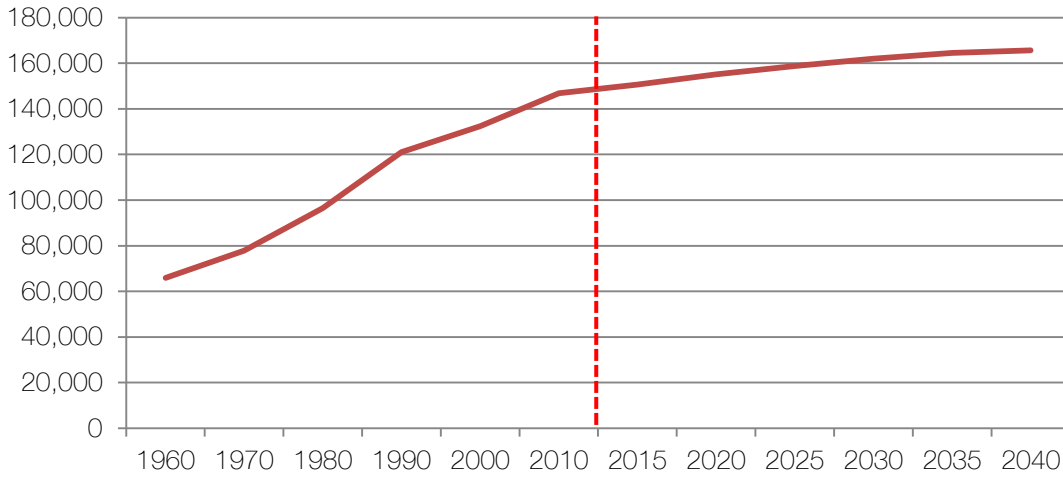


Exhibit 8 – Projected Population 2015-2040

	2015	2020	2025	2030	2035	2040
Brookfield	748	802	831	856	873	880
Barrington	8,930	9,319	9,536	9,730	9,883	9,970
Dover	30,808	31,733	32,470	33,131	33,652	33,950
Durham	15,295	16,015	16,387	16,720	16,983	17,134
Farmington	7,145	7,535	7,710	7,867	7,991	8,061
Lee	4,301	4,282	4,381	4,470	4,540	4,581
Madbury	1,863	1,964	2,010	2,051	2,083	2,101
Middleton	1,920	2,068	2,116	2,159	2,193	2,212
Milton	4,842	5,108	5,227	5,333	5,417	5,465
New Durham	2,791	2,957	3,026	3,088	3,136	3,164
Newmarket	9,257	9,696	9,909	10,081	10,169	10,150
Northwood	4,485	4,789	4,895	4,980	5,023	5,013
Nottingham	5,279	5,853	5,981	6,085	6,138	6,127
Rochester	29,567	29,442	30,126	30,739	31,222	31,499
Rollinsford	2,382	2,237	2,289	2,336	2,372	2,393
Somersworth	11,569	11,390	11,655	11,892	12,079	12,186
Strafford	4,073	4,169	4,265	4,352	4,421	4,460
Wakefield	5,367	5,784	5,995	6,173	6,293	6,348
Strafford Region	150,622	155,143	158,809	162,043	164,468	165,694

Source: NH OEP 2013 Population Projections



According to Census figures, the Strafford region gained 14,438 residents between 2000 and 2010. Between 1990 and 2010, the region grew by nearly 26,000. The region grew by 10.9% percent between 2000 and 2010, in parallel with statewide growth numbers.

Data in Exhibit 6 outline the changes in city and town population between 1960 and 2010, which are the most recent census estimates of current population available. When examining the population change between 2000 and 2010, the State's overall growth rate was 10%. There are 15 municipalities with growth rates higher than the state. Most of these municipalities are classified as bedroom communities. The community experiencing the highest growth rate was Nottingham with a 29.3% percent growth rate from 2000 to 2010.

Exhibit 8 also shows that the State of NH has had a slightly lower percent change in population growth compared to the US from 1970 to 2010. The population growth slowed in Strafford County from 2000 to 2010 in a similar manner to the US in general.

Age Cohorts

According to the 2010 US Census, the largest age group in the Strafford region is 40 to 64 years, followed by the 20-39 year age group, and the 5-19 year age group (Exhibit 9, to the right).

Age patterns throughout the region were similar to the statewide numbers as well. The median age for the Strafford region was 40 years, which is 2 years younger than the median age for the State, and 3 years older than the United States overall.

Age is important to consider as there may be less of a demand for broadband among older generations. In *The Two New Hampshires: What does it mean?*, author Ross Gittell explains that if rural New Hampshire were its own state, it would

have the second highest population of 65+ individuals, second only to Florida^{xxx}. While this may explain those who don't currently have service, or those who have service but don't feel a need to upgrade, age can also be seen as support for increased service. In order to encourage economic development in the region, it is important to encourage young professionals to live, work, and play in the granite state, and in particular the region. As younger generations tend to rely heavily on adequate broadband services, it is important to understand the current broadband infrastructure in the region, and what can be done to improve it.

Exhibit 9 – Population Estimates by Age Group

Municipality	Total pop	Under 5 years	5-19 years	20-39 years	40-64 years	65+ Years
Barrington	8576	541	1705	1931	3580	819
Brookfield	712	19	137	106	317	133
Dover	29987	1805	4852	9700	9712	3918
Durham	14638	214	4977	6233	2202	1012
Farmington	6786	445	1341	1693	2557	750
Lee	4330	229	933	921	1825	422
Madbury	1771	110	389	365	732	175
Middleton	1783	115	345	464	695	164
Milton	4598	280	882	1049	1864	523
New Durham	2638	144	528	507	1141	318
Newmarket	8,936	583	1357	3073	3052	871
Northwood	4,241	216	863	901	1764	497
Nottingham	4,785	323	926	1100	2023	413
Rochester	29752	1796	5393	7374	10792	4397
Rollinsford	2527	143	483	541	1011	349
Somersworth	11766	816	2159	3328	4069	1394
Strafford	3991	179	873	701	1834	404
Wakefield	5078	252	874	980	2091	881
Strafford region	146895	8210	29017	40967	51261	17440
Carroll County	47818	1970	7828	8300	19882	9838
Rockingham County	295223	14983	58842	63375	120599	37424
Strafford County	123143	6817	24860	34807	42014	14645
New Hampshire	1316470	69806	255996	311170	501230	178268

Source: US Census, 2010

Wages and Income

According to the 2008-2012 ACS 5-Year Estimates the state of New Hampshire's median family income is \$79,488. Similarly, the Strafford region has an average median family income of \$78,194.83. The highest median family income occurs in Durham at \$114,191.

Median household income, another ACS measure, looks at income of the householder, as well as all others 15 years old and over in the household, regardless of whether they are related to the householder or not.^{xxxii} Median household income in the Strafford region is at \$66,532. Per capita income is the average money income received in the past 12 months for every man, woman, and child in a geographic area.^{xxxiii} Strafford region residents make on average \$30,993 per year.

Examining income in the region is important to examine when considering affordability of improved and increased broadband services for Strafford region residents. In the *NH Regional Planning Commissions: A Granite State Future 2013 Statewide Survey* 31% of Strafford region residents explained that they don't have broadband service because it is too expensive. In addition, 31% one percent of regional respondents also shared that they pay \$100 or more for their current monthly internet bill. When asked about increasing their service, 84% of respondents in the region said they are not willing to pay more for faster broadband speeds.

Exhibit 10 – Regional Income and Poverty

Geography	Median Family Income	Median Household Income 2008-2012	Per Capita Money Income 2008-2012	Below Poverty 2008-2012
United States	\$64,585	\$53,046	\$28,051	14.9%
New Hampshire	\$79,488	\$64,925	\$32,758	8.4%
Strafford region	\$78,194.83	\$66,532	\$30,993	8.4%
Barrington	\$87,252	\$81,714	\$32,314	6.2%
Brookfield	\$71,181	\$67,604	\$30,603	4.3%
Dover	\$72,797	\$55,890	\$31,158	10.3%
Durham	\$114,191	\$72,176	\$25,664	20.1%
Farmington	\$63,326	\$55,451	\$27,948	12%
Lee	\$98,387	\$74,873	\$38,554	5.4%
Madbury	\$98,594	\$82,500	\$33,514	8.3%
Middleton	\$61,111	\$55,703	\$24,775	8.2%
Milton	\$58,880	\$59,467	\$31,951	10.8%
New Durham	\$83,409	\$80,511	\$32,440	4.2%
Newmarket	\$84,292	\$60,398	\$32,032	11.6%
Northwood	\$69,187	\$65,417	\$34,204	3.1%
Nottingham	\$96,452	\$88,542	\$36,058	4.1%
Rochester	\$62,044	\$49,366	\$28,135	12.3%
Rollinsford	\$80,809	\$63,605	\$30,544	8.4%
Somersworth	\$69,578	\$53,354	\$24,360	15.8%
Strafford	\$82,679	\$85,682	\$32,632	3.6%
Wakefield	\$53,338	\$45,323	\$25,003	6.6%

Source: ACS 5-yr 2008-2012

Regional Housing

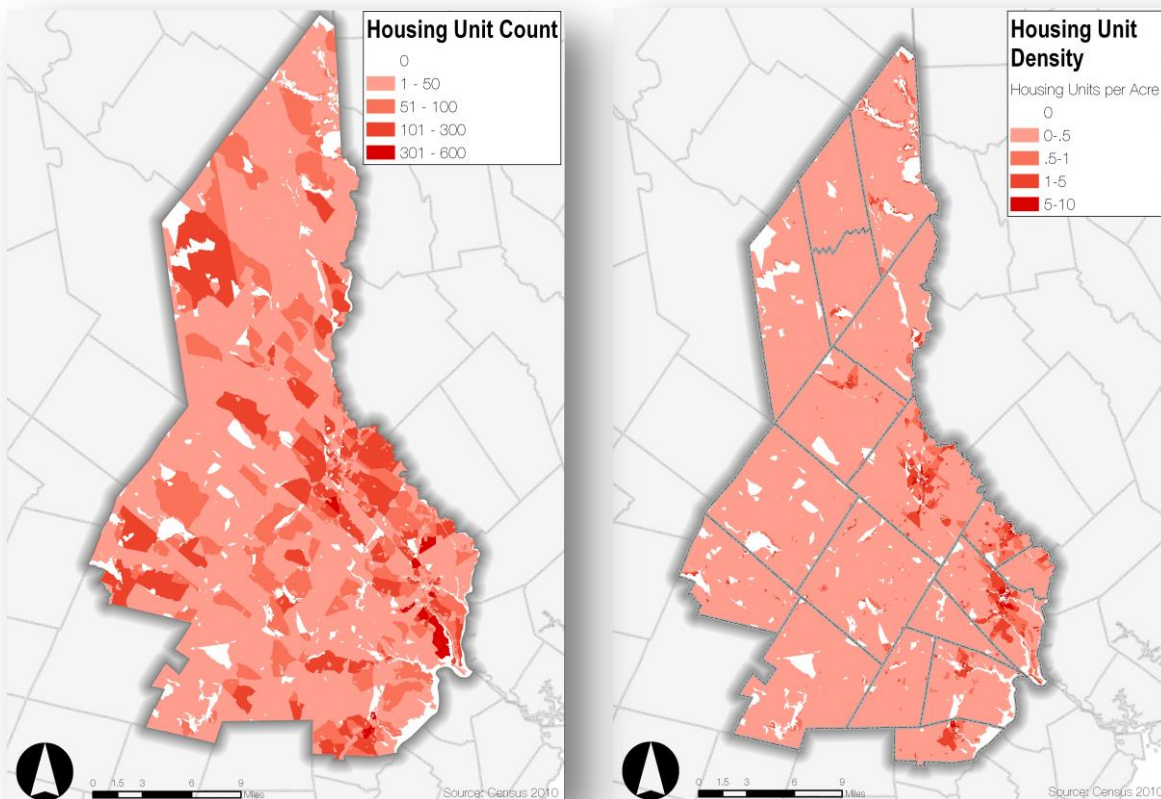
One goal of the NH Broadband Mapping and Planning Program is to address those who do not have broadband access. Providers are more apt to provide services in areas that are more concentrated than others. This may mean some individuals living in areas that are less densely populated have a more difficult time getting service.

Considering this, it is important to look at housing units in the region. Housing units include apartments and houses. Exhibit 11 shows housing units by block level in the region. Concentrations of housing units vary across the region, and as shown in Exhibit 11, there are still many areas that have little or no housing.

The majority of the region is not very dense either. Density is measured on the block level and looks at the number of housing units per acre. The highest density of housing units occurs in our region's cities while the majority of the region has 0 to .5 housing units per acre, making it appear that individuals in the Strafford region have moderate property sizes per housing unit.

Exhibit 11 – Housing Unit Count & Housing Density

[Source: Census Bureau, SRPC]



Regional Economy

The health of the Strafford regional economy relies greatly on the condition of other counties abutting the area, and New Hampshire's, and New England's economies, which are linked to the national and global economies. Today the region's economy is more than business or industries located in individual communities: most workers commute to other communities. The economy in the Strafford region is closely tied to Rockingham County, northern Massachusetts (Essex, County), and southwestern Maine (York County). Many residents in Strafford region commute to Pease International Tradeport, Portsmouth Naval Shipyard, and as far as Metro and Downtown Boston. The region's businesses and industries are diverse, including: high tech manufacturing, financial services, educational services and institutions, medical or healthcare and service industry.

Major Employers

The largest employer in the Strafford region is the University of New Hampshire with over 4,000 employees, which accounts for close to 20% of the employment in the region based on the *Census Community Profiles*. The next largest employer in the region is Liberty Mutual, an insurance provider located in Dover. The majority of major employers in the region require adequate and reliable broadband service and speeds. It is therefore important to understand where the largest employers in the region are located. The *National Broadband Plan* compares broadband to electricity as a foundation for growth of our economy^{xxxiv}.

The tables below show the top employment sectors in the region, as well as the top ten businesses in the region. This is important to consider when looking at broadband in the region with the realization that there are large business in the region requiring adequate service to complete daily functions during the workday.

When interviewing the Technology Director, Shawn Linscott, from one of the region's largest employers, Frisbie Memorial Hospital, the importance of Broadband in the healthcare field was related to the need for fast and reliable broadband service. Linscott shared that most of the hospitals' facilities run off fiber, but that there is still a need for faster service. Linscott shared that Frisbie Memorial needs more bandwidth and more service provider options. Because of redundancy, there is a necessity for more networks.

Exhibit 12 – Top Regional Employment Industries

NAICS	Industry	Employees
	Local Government	5983
	State Government	4025
722	Food Services and Drinking Places	3,710
524	Insurance Carriers and Related Activities	3,211
621	Ambulatory Healthcare Services	2,608
445	Food and Beverage Stores	1,989
561	Administrative and Support Services	1,859
541	Professional and Technical Services	1,472
623	Nursing and Residential Care Facilities	1,081
452	General Merchandise Stores	1,069
333	Machinery Manufacturing	952
238	Specialty Trade Contractors	870
441	Motor Vehicle and Parts Dealer	822
334	Computer and Electronic Product Manufacturing	790
326	Plastics and Rubber Products Manufacturing	756
444	Building Material and Garden Supply Stores	720
611	Educational Services	706
522	Credit intermediation and Related Activities	617
812	Personal and Laundry Services	606
5613	Employment Services	581

Source: NH Economic and Labor Market Information Bureau, SRPC, 2012



Exhibit 13 – Regional Employment By Industry

NAICS	Industry	2005		2012		Change	
		Employees	% of Total	Employees	% of Total	Employees	% Change
	Total, Private Industries plus Government	47,353	100%	48,385	100%	1,032	2.2%
11	Agriculture, Forestry, Fishing and Hunting*	186	.39%	172	.4%	-14	-7.5%
21	Mining*	36	.08%	32	.1%	-4	-11.1%
23	Construction	2018	4.26%	1343	2.8%	-675	-33.4%
31-33	Manufacturing	5828	12.31%	4982	10.3%	-846	-14.5%
22	Utilities*	n	n	n	N	N	N
42	Wholesale Trade	1407	2.97%	1146	2.4%	-261	-18.6%
44-45	Retail Trade	6845	14.46%	6699	13.8%	-146	-2.1%
48-49	Transportation and Warehousing	860	1.82%	790	1.6%	-70	-8.1%
51	Information	1100	2.32%	1128	2.3%	28	2.5%
52	Finance and Insurance	2039	4.31%	3894	8%	1,855	91%
53	Real Estate and Rental and Leasing	496	1.05%	431	.9%	-65	-13.1%
54	Professional and Technical Services	1490	3.15%	1472	3%	-18	-1.2%
55	Management of Companies and Enterprises*	355	.75%	N	n	n	N
56	Administrative and Waste Services	1781	3.76%	2102	4.3%	321	18%
61	Educational Services*	675	1.43%	706	1.5%	31	4.6%
62	Healthcare and Social Assistance	5794	12.24%	6716	13.9%	922	15.9%
71	Arts, Entertainment, and Recreation	666	1.41%	630	1.3%	-36	-5.4%
72	Accommodation and Food Services	3797	8.02%	3994	8.3%	197	5.2%
81	Other Services Except Public Administration	1496	3.16%	1521	3.1%	25	1.7%
	Total Government	10397	21.96%	10362	21.4%	-35	-.3%

Source: NH Economic and Labor Market Information Bureau, SRPC, 2005-2012

Exhibit 14 – Major Regional Employers by Municipality

Largest Business	Product/Service	Employees	Established
Dover			
Liberty Mutual	Insurance services	3,500	
City of Dover	Municipal services	1139	1855
Wentworth-Douglass Hospital	Healthcare services	1,100	
Durham			
University of New Hampshire	Education	4,077	
Goss International Printing Press	Printing Press	417	
Rochester			
City of Rochester	Municipal services	617	1891
Frisbie Memorial Hospital	Healthcare services	655	1919
Albany Engineered Composites	Aerospace engineered products	433	1895
Hannaford Brothers	Supermarket	464	1963
City of Rochester - Schools	Education	1,155	
Somersworth			
General Electric Co.	Manufacturing, meter control division	500	

Source: NH Community Profile, NHES, 2012



Self-Employment

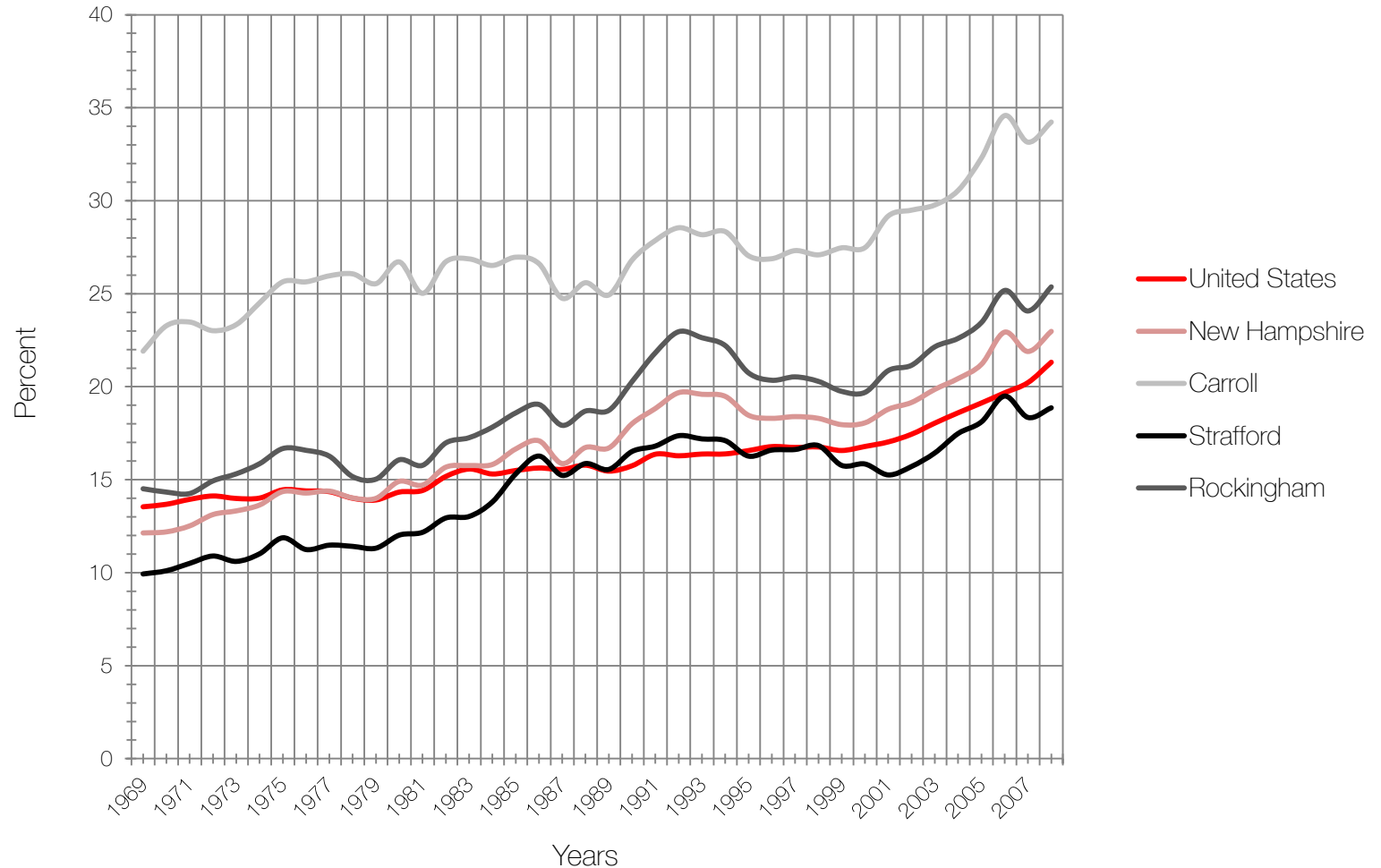
The self-employment rate is the percent of all employed people who have their own businesses (*proprietors*) as opposed to working for someone else in the return for wages or salary.

Self-employed also tend to rely on broadband service to not only advertise their businesses, but run them as well. There had been a steady increase in the amount of individuals that are self-employed in the counties that encompass our region between 1969 and 2007, which is the most recent and accurate data available.

Telecommuting is another factor to consider, which requires that individuals have reliable broadband services at home in order to get their work done outside of the office. While no data directly addresses telecommuting in New Hampshire, it is an issue that should be kept in mind.

Exhibit 15 – Self Employment Rates

[Source: Carsey Institution UNH, 1969-2008: Bureau of Economic Analysis, Regional Economic Data, Local Area Personal Income]



Education

Educational Opportunities

In addressing broadband and education, the *National Broadband Plan* highlights the role of broadband in the education sector stating, "Broadband can be an important tool to help educators, parents and students meet major challenges in education. The country's economic welfare and long-term success depend on improving learning for all students, and broadband-enable solutions hold tremendous promise to help reverse patterns of low achievement."^{xxxv}

High schools in the region are included in SAUs, or School Administrative Units. There are 98 SAUs in the state, with five additional private schools^{xxxvi}. Career Technology Centers are located throughout the region as well, and offer hands-on educational opportunities to students. Examples in the Strafford region are Dover High School, Spaulding High School in Rochester, and Somersworth High School.

For post-secondary education, the Community College System of New Hampshire (CCSNH) is comprised of seven community colleges and four academic centers throughout the state that offer associates degrees, professional training, and transfer pathways to four-year degrees. The University System of New Hampshire (USNH) consists of the University of New Hampshire (Manchester and Durham campuses), Granite State College, Keene State College, and Plymouth State University^{xxxvii}. In the Strafford region, UNH Durham serves over 14,000 students and is among the top national research institutions with Sea and Space grants in addition to the original Land grant. All in all, the state has 23 other colleges and universities not included in the USNH system.

NH Adult Education serves adults who have not earned a high school diploma or GED certificate, or who seek to improve their reading, writing, or speaking skills for greater participation in family, work and community life. In the region, Dover Adult Learning Center serves Strafford County with permanent locations in Dover and Rochester and outreach locations in Milton and Farmington. Dover Adult Learning Center helps adults improve their lives through basic education, job training, high school completion, college and career transitions and enrichment classes

Educational Attainment

Educational attainment in the region has been examined in the counties in which our communities are located, as the margin of error is high in the data for SRPC's communities individually. In Carroll County, for those over 25 years old, 29.9% of the population surveyed for the ACS 2008-2012 5 year estimates have their bachelor's degree or higher, while in Strafford County it is 30.8% and in Rockingham County, 36.7%. The margin of error is lower for these numbers.

Exhibit 16 - Education Attainment – County Level

	Population 25 years and over	Less than 9th grade	9th to 12th grade, no diploma	High school graduate (includes equivalency)	Some college, no degree	Associate's degree	Bachelor's degree	Graduate or professional degree
Carroll County	36,107	2.3%	6.2%	31%	20.3%	10.4%	18.9%	11%
Rockingham County	206,861	1.6%	4.4%	28%	19.2%	101%	23.5%	13.2%
Strafford County	78,797	3.3%	5.8%	29.5%	19.9%	10.7%	19%	11.8%

Source: ACS 2008-2012 Table S1501



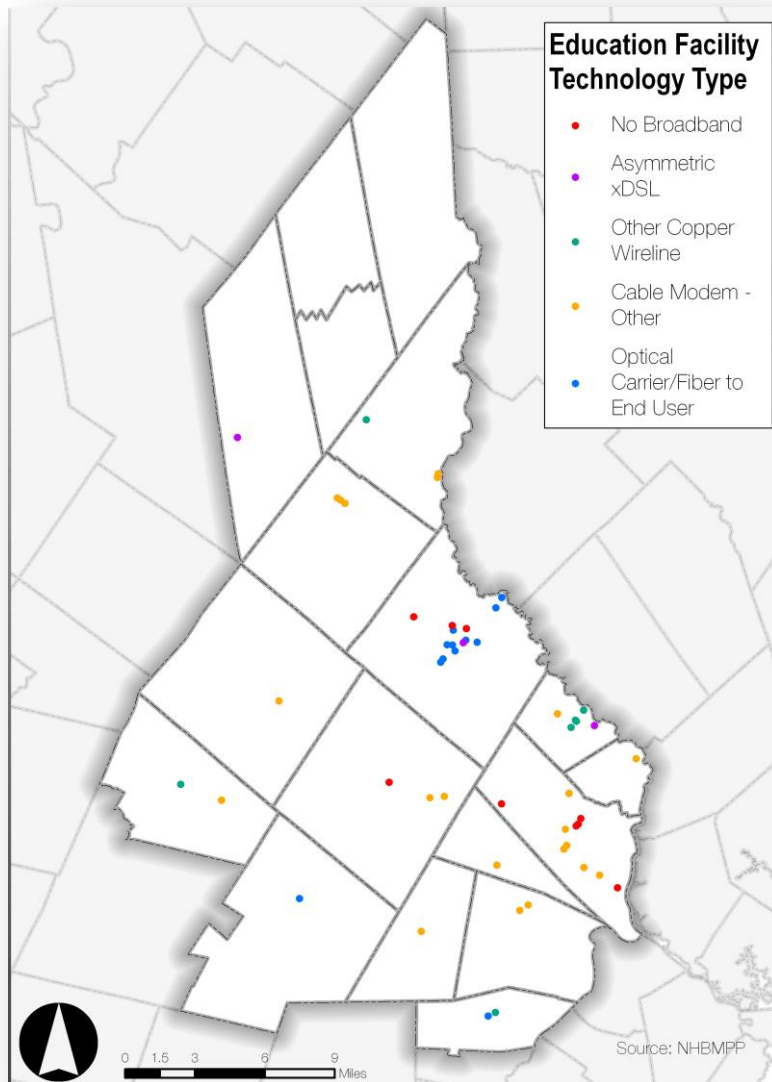
Looking at educational attainment in conjunction with current service of and future expansion for broadband is important as broadband not only provides necessary functions in the education system, but is also useful to those in many professional jobs resulting from such educational attainment.

Education Community Anchor Institutions

As part of the effort to understand Broadband in the region, including speeds, accessibility, proficiency of service, etc., each region identifies Community Anchor Institutions within their planning commission boundaries. These anchor institutions included schools, hospitals, public safety centers, healthcare facilities and other facilities important to the communities in which they were located. Data was requested from these facilities on a scheduled basis that included 10 data submission rounds over three plus years. There are 55 educational community anchor institutions in the region. The services for these locations vary. The locations and speeds these educational community anchor institutions are receiving can be viewed using the interactive online mapping component of iwantbroadbandnh.org.

Exhibit 17 – Education Community Anchor Institutions

Source: NHBMPP, SRPC



Regional Broadband Availability



Regional Demand for Broadband



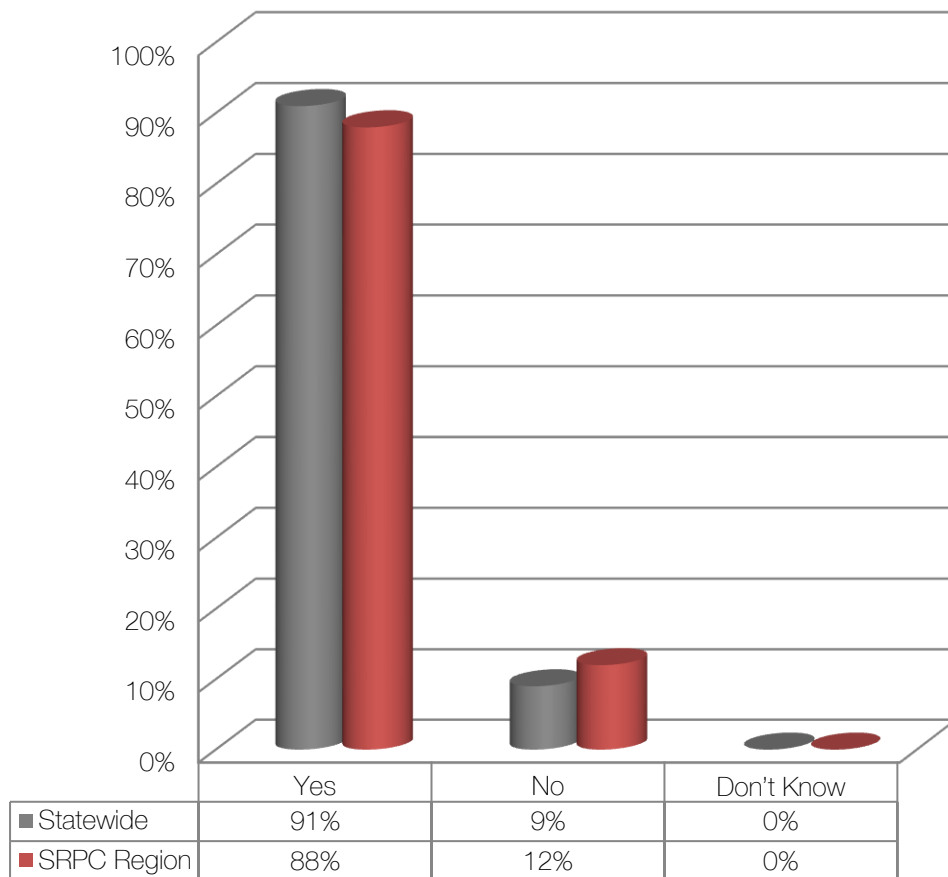
Survey/Public Forum results

In conjunction with the Granite State Future project – a statewide effort to examine existing conditions in New Hampshire and plan for the future in the form of regional master plan updates – the University of New Hampshire Survey Center conducted a statewide survey of over 2000 New Hampshire residents. This survey took place from May to July of 2013 and asked participants to answer questions related to topics of interest such as housing, transportation, economic development, and broadband internet access. The margin of sampling error for the survey was +/- 2.2%.

Below are the results from the survey questions concerning broadband availability, coverage, usage, speed adequacy, and etc. The results show the responses on a statewide level, and at a regional level, for comparative purposes.

Exhibit 18 – Residential Internet Access

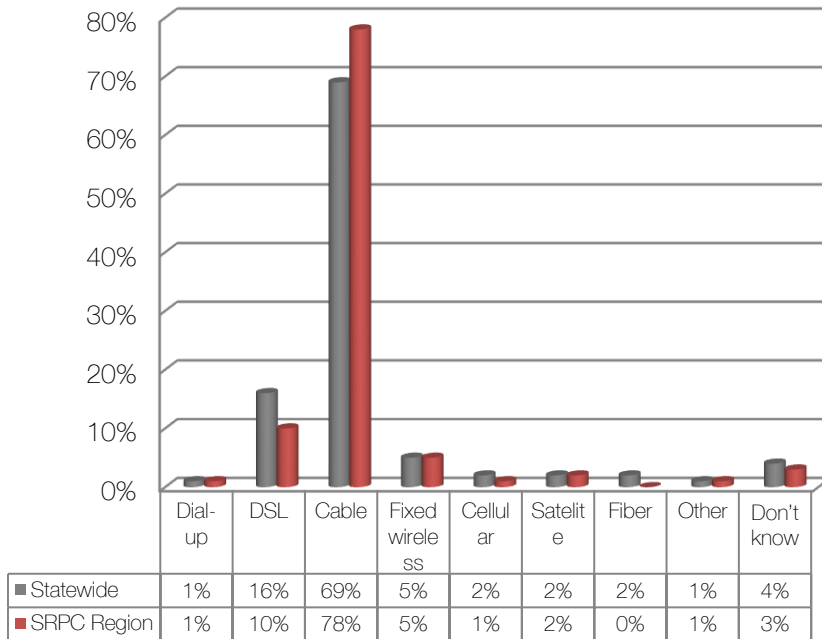
Do you have internet access at home?



Statewide, 91% of respondents have internet access at home. The Strafford region boasts comparable numbers as 88% reported having access. However, the Strafford region has the third lowest accessibility of the seven regions surveyed.

Exhibit 19 – Internet Connection Technology Type

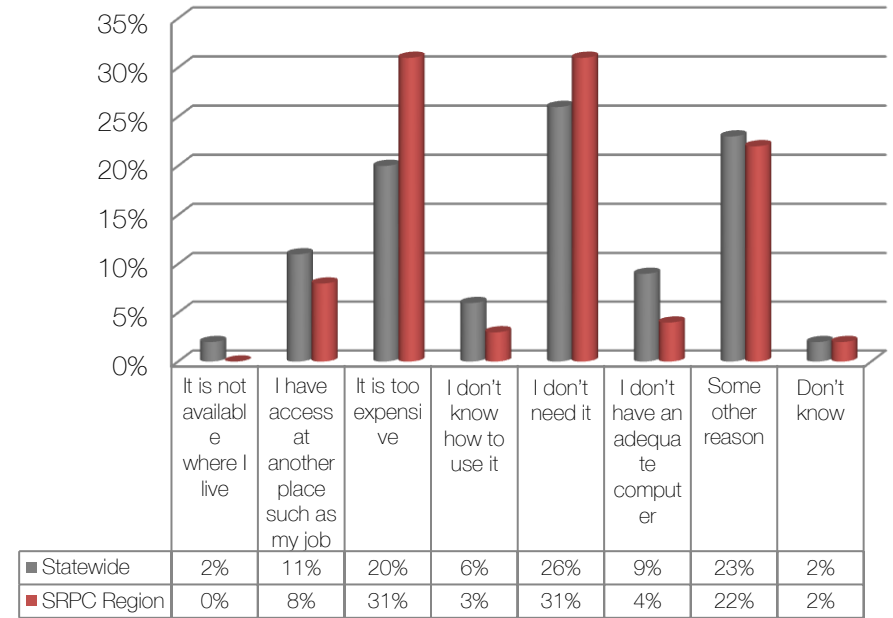
What type of connection do you have to the internet at home?



The majority of residents surveyed statewide, and in the Strafford region, connect to the internet via cable technologies. The second largest connection type, DSL, connects 16% of respondents statewide, and 10% of individuals surveyed in the Strafford region. Other connection types include dial-up, fixed wireless, cellular, and satellite, which together connect less than 5% of residents surveyed.

Exhibit 20 – No Connection Justification

Which of the following is the most important reason why you don't have internet access at home?

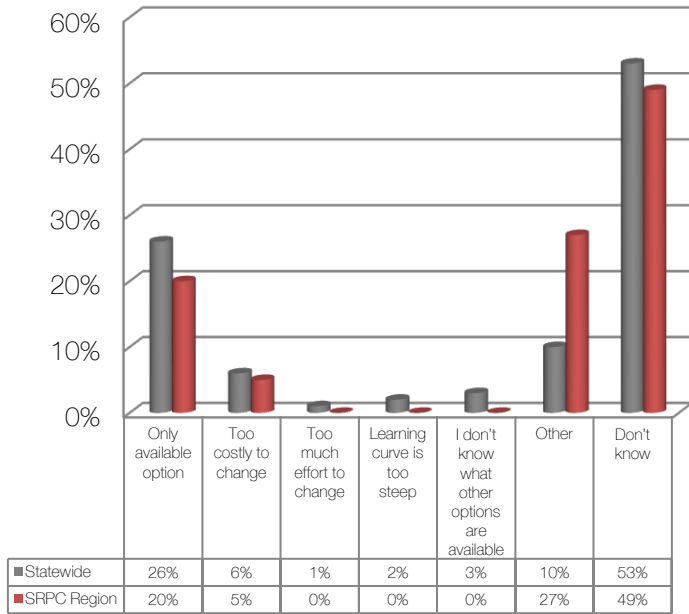


Among respondents that do not have an at-home connection, the top reason as to why they have not invested in residential service is that they do not consider broadband service to be a necessity. Price of service is another substantial barrier to subscription.



Exhibit 21 – Satellite or Dial-Up Justification

If you are on dial-up or satellite, why?



When addressing use of current service provider, 39% of respondents statewide and 44% in the SRPC region expressed that they were using their current provider because it was their only available option. Customer satisfaction was also a popular response. In the Strafford region, 31% of residents surveyed pay \$100 or more for their monthly internet bill, which is higher than the percentage statewide. On a statewide level, a higher percentage of respondents pay between \$50 and \$99 a month. For the 1% of respondents who have dial-up internet in the region, the majority did not express why they have not upgraded service, while others indicated that it is the only option available.

Exhibit 22 – Monthly Internet Costs

What is your current monthly internet bill?

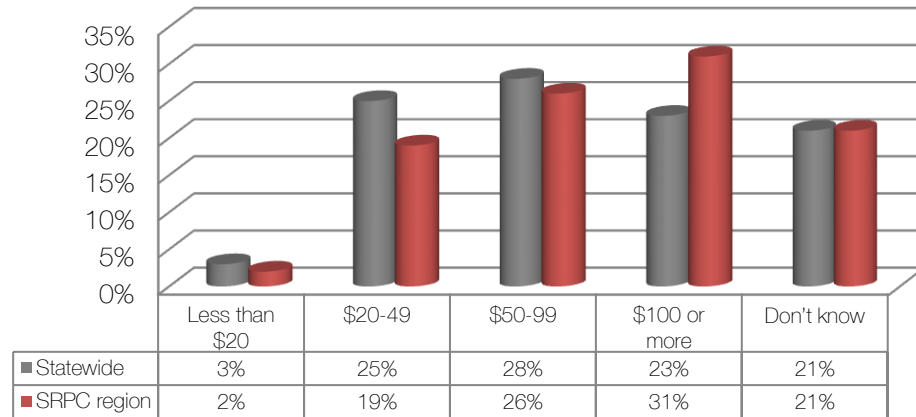


Exhibit 23 – Current Provider Justification

Why are you using your current provider?

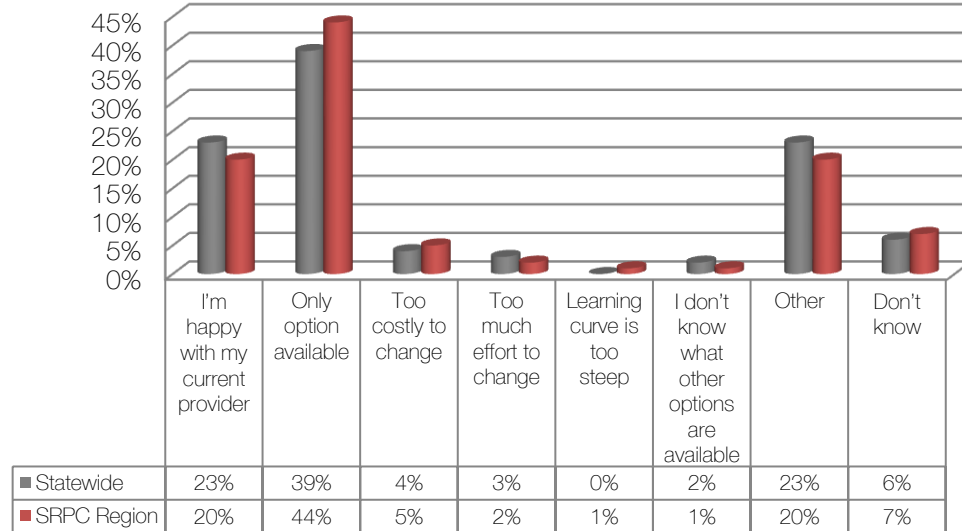
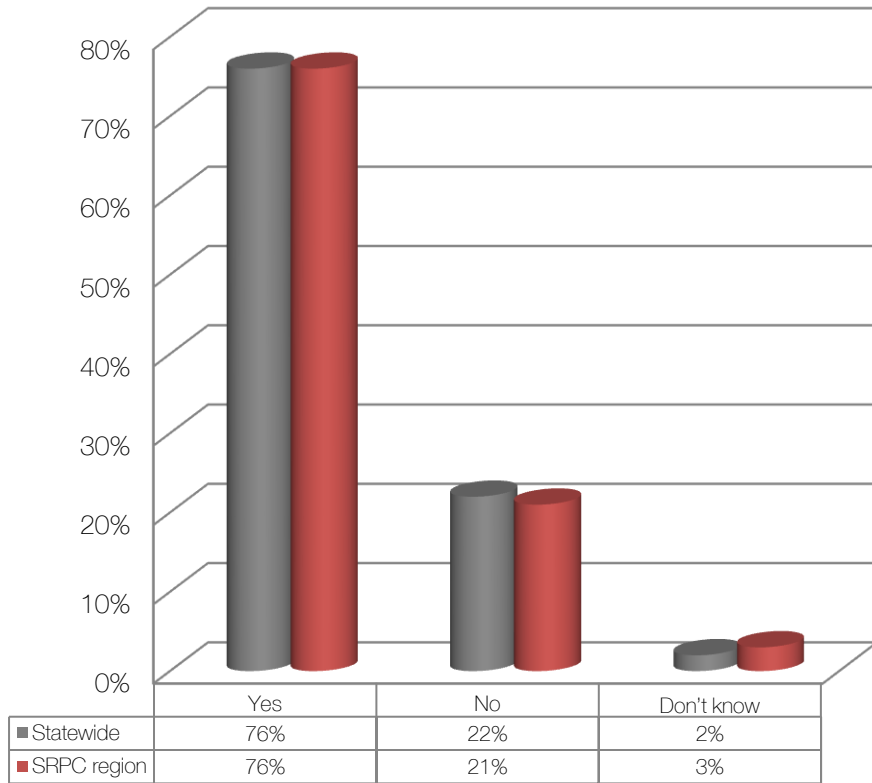


Exhibit 24 – Bundled Service Status

Do you pay for bundled service (internet, TV, phone)?

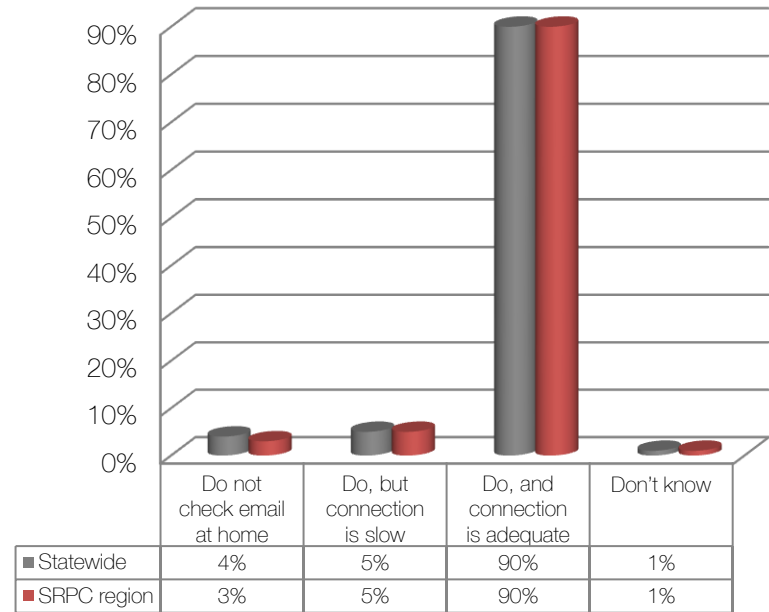


Three out of four respondents statewide and in the Strafford region pay for bundled internet service.

Exhibit 25 – E-Mail Accessibility

Do you use the internet to check your email at home?

If yes: Is the speed of your internet connection too slow, or is the speed of your internet connection adequate for this?



The majority of residents surveyed (90%) use their internet connection to check email at home and believe their connection speeds are adequate.



Exhibit 26 –Shop-At-Home Accessibility

Do you use the Internet to shop on-line at home?

If Yes: Is the speed of your internet connection too slow, or is the speed of your internet connection adequate for this?

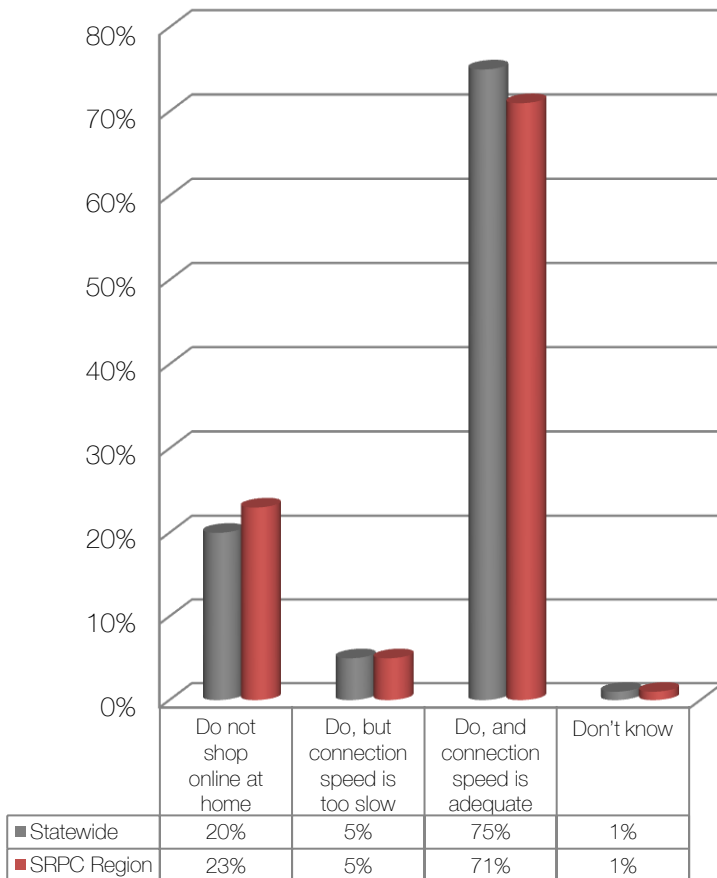
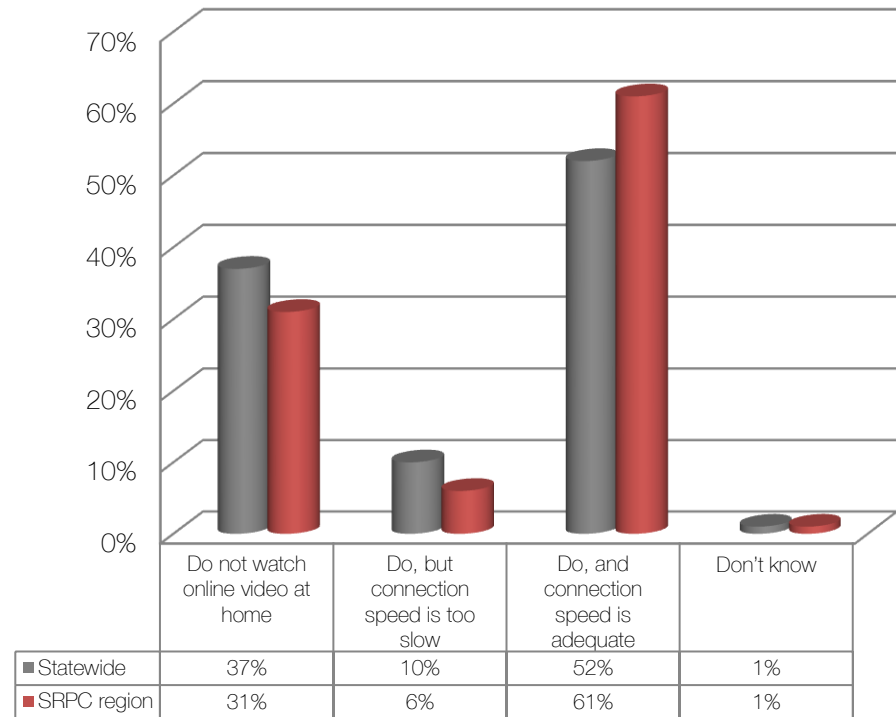


Exhibit 27 - Video Streaming Accessibility

Do you use the Internet to watch online video, such as on YouTube or Netflix at home?

If Yes: Is the speed of your internet connection too slow, or is the speed of your internet connection adequate for this?

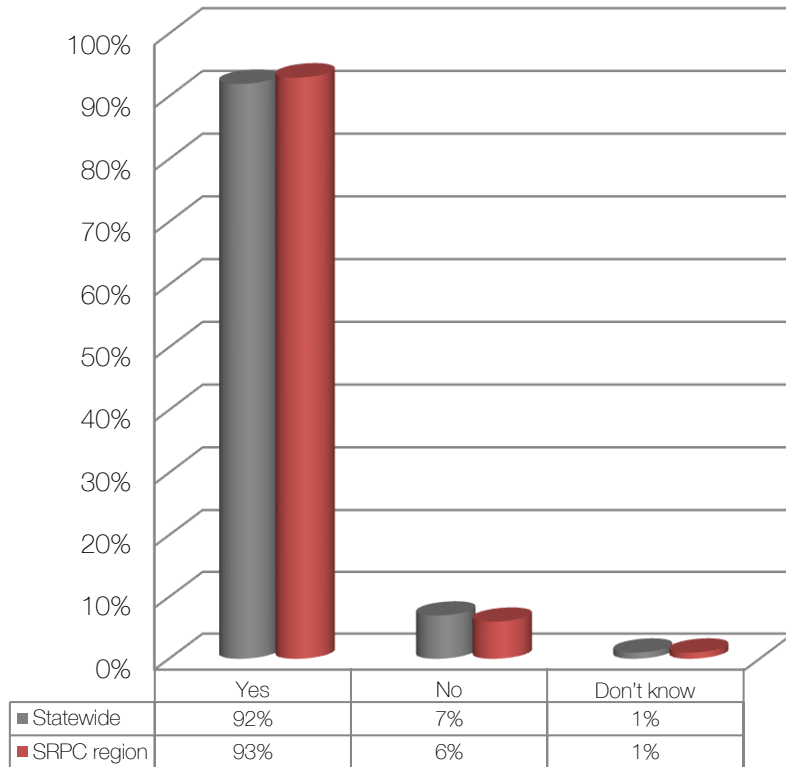


For respondents shopping online, three out of four believe their connection speed is adequate while 7 in 10 find this to be true in the Strafford region. For online video streaming, a majority of respondents found their connection adequate. However 31% of individuals do not stream online videos in the region.



Exhibit 28 – Home Connection Adequacy

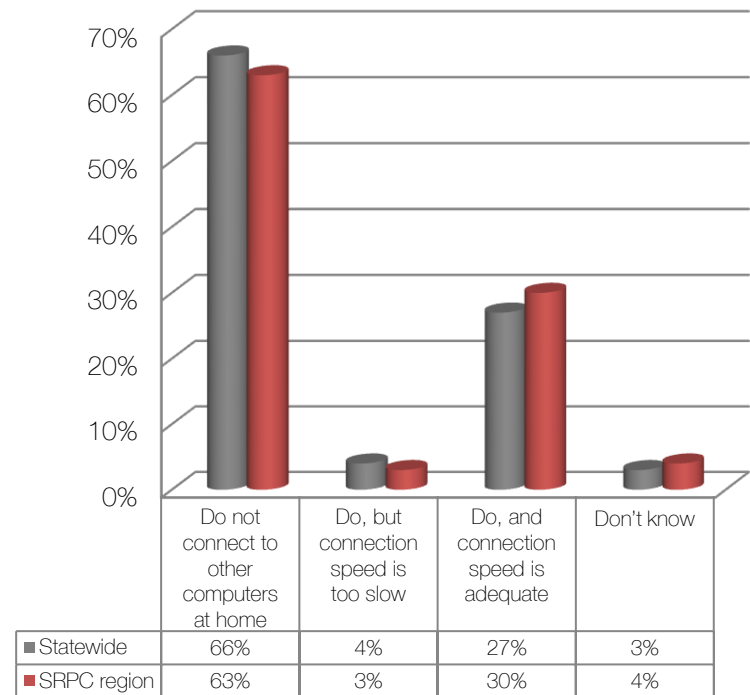
Overall, do you consider your internet connection at home to be adequate for your uses?"



Nine out of ten individuals surveyed found their overall internet connection at home to be suitable for their needs.

Exhibit 29 – VPN Accessibility

Do you use the internet to connect to other computers using VPN at home?"
If yes: Is the speed of your internet connection too slow, or is the speed of your internet connection adequate for this?"

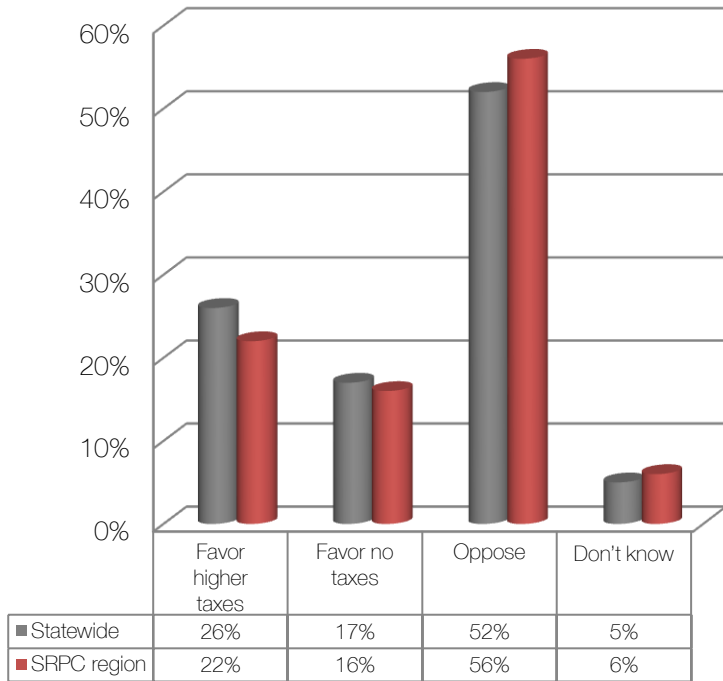


The majority of individuals (66% statewide and 63% in the region) do not access VPN networks from home. For those who do connect, the majority found their connection speeds to be capable (27% statewide and 30% in the region).



Exhibit 30 – Municipal Funding of Broadband Infrastructure

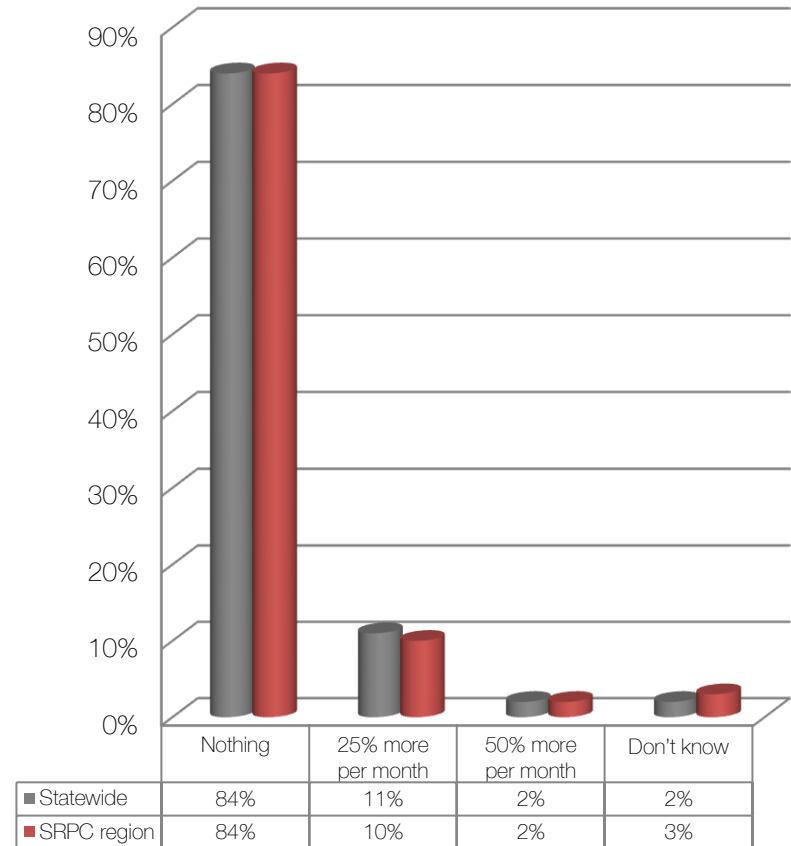
Do you favor or oppose - using municipal funds to provide the following utilities to existing and potential development? Broadband Access
 If Favor: Would you be willing to pay higher fees or taxes to pay for it?



20 % in the Stafford region, and 26% statewide, favor higher taxes that would aid infrastructure construction. In contrast, 16% favor this idea, but not if taxes have to be raised. An overwhelming majority of respondents do not favor using municipal funds to provide utilities in existing and potential development.

Exhibit 31 – Increased Cost vs. Increased Speed

How much more (if any) would you be willing to pay for faster internet speeds?"



Eight in ten individuals are not willing to pay more for faster internet speeds. One in ten individuals are willing to pay 25% more per month for faster speeds, and only 2% are willing to pay 50% or more for faster speeds.



Public Involvement Process

As an organization, Strafford Regional Planning Commission's mission is "to assure that the region is responsive to the needs of its residents through cooperation with federal and state agencies and its member communities" (SRPC Handbook, 2006). Input from stakeholders in and adjacent to the Strafford region is an essential component of all planning processes. For the purpose of writing a Regional Broadband Plan, Strafford Regional Planning Commission encouraged community involvement via multiple mediums. The designation, mapping, and data collection effort from the region's community anchor institutions was one such method of educating professionals in various sectors

about the basics of the New Hampshire Broadband Mapping and Planning Program. In addition, SRPC's Regional Public Broadband Forums, sought to not only educate but engage citizens and immerse them in the vision-based dialogue related to broadband adoption and utilization. In an effort to understand the professional sector-specific needs for broadband services, staff conducted sector-based interviews with individuals currently employed or with expertise in the areas of healthcare, economic development, public safety, local government, and education. All of this work was done with the assistance of our most critical public involvement tool, our Broadband Stakeholder Group.

Regional Broadband Forums

SRPC staff, along with the Broadband Stakeholder group, in an effort to involve citizens and citizen-groups, held three Regional Public Broadband Forums in September of years 2012, 2013, and will hold its third in 2014. The intent of these of events was to catalyze and continue a rich dialogue amongst stakeholders related to broadband,

while serving to educate attendees about the background and progress of the New Hampshire Broadband Mapping and Planning Program. The results of this ongoing public conversation are reflected in not only the goals of this plan, but also in the objectives and implementation projects listed herein.



Exhibit 32 – Regional Broadband Forum

Source: SRPC



Sector-Based Interviews

A sector-focused analysis was conducted by SRPC, intended to create a more comprehensive understanding of current and future broadband uses, needs, barriers, and goals for building a better broadband system in the region.

The choice to utilize a sector-based interview approach was based on the idea that talking one-on-one could allow for more in-depth conversations when compared with a group setting. This process proved extremely insightful for determining uses, needs, barriers, and goals specific to each public sector.

SRPC interviewed ten professionals from the sectors of public safety, healthcare, local government, education, and economic development.

Participants included IT managers for Towns, healthcare facilities, and schools, University professors, and public safety officials, emergency responders, and a hazardous materials specialist. Each interview was recorded and transcribed (See Sector-Based Interviews Appendix).

Broadband Stakeholder Group

The formation of a Strafford region Broadband Stakeholder Group in 2011 of the New Hampshire Broadband Mapping and Planning Program is of utmost criticality to the completion and drafting of this planning document. The BSG, upon its conception, was tasked with the following:

- Identification of barriers to broadband provision, adoption and utilization
- Prioritizing and identification of need for broadband services
- Collecting and analyzing information on use and demand for broadband services
- Encouraging and fostering collaboration amongst public and private partners
- Consideration of broadband services as a component of basic infrastructure

Stakeholder group members were chosen based on their expertise in varying areas of the community including public safety, healthcare, government, education, and economic development. Meetings were held quarterly throughout the project between 2011 and 2014.



Broadband Center of Excellence

Broadband Center of Excellence founder Rouzbeh Yassini, and UNH Interoperability Staff Erica Johnson, and Lincoln Lavoie participated in SRPC Broadband Stakeholder groups in efforts to understand the uses, needs, and barrier for broadband in the region. Through these conversations, SRPC was introduced to the emerging idea of an organization that would champion for broadband technologies in the state.

The Broadband Center of Excellence (BCOE), which officially launched on October 1, 2013, is an organization focused on the benefits of broadband in enabling community, learning, and growth. Rouzbeh Yassini, Director of the Broadband Center of Excellence, champions for broadband as a major proponent in the growth of our economy and economic future, and how increasing broadband connectivity in the state and nation should be a top priority among those eager to witness this change.

Partners of the BCOE included the Yassini Broadband Knowledge Center, the UNH Interoperability Lab (IOL), Connect NH, and the NH Broadband Mapping & Planning Program (NHBMPP). Recent efforts include published reports such as *Broadband 2030: The Networked Future*, *Broadband 2020: Achieving Ubiquity*, and other conferences and workshops such as *Powering Possibility: Broadband's New Era*.

NHBMPP Mapping Verification Project

In an effort to improve the accuracy of the data gathered by the University of New Hampshire (UNH) depicting broadband service coverage, community-level maps were distributed to each of the Regional Planning Commissions. The maps display where service is present along road segments and what technologies are offered (Cable or DSL).

SRPC staff met with appropriate community leaders and staff in one-on-one sessions to discuss data inaccuracies and project background. Map reviewers included individuals in various positions, from municipal IT Directors, to Town Administrators and Selectman.

Often, experts were able confirm the absence or presence of services. In other cases, comments related to the current use of roadways or presence of structures, were provided. Both New Durham and Strafford were able to provide guidance based on coverage maps provided to them by their franchised provider. Similarly, Durham has, as part of their cable franchise agreement

negotiations, requested GIS service coverage layers are provided to them.

In addition to meeting with individuals from its communities, SPRC utilized the cable verification fieldwork guide created collaboratively by Southwest Regional Planning Commission and UNH to perform field broadband data confirmation. This document provided guidance on identifying telecommunications equipment on utility poles.

Staff was able to examine "DSL only" data areas by field-checking for cable service along road segments. Additionally, comments received during meetings were also confirmed or denied via fieldwork.

After performing field verification, final edits to the community maps were made, and they were returned to UNH. This information, when processed, was used to update coverage maps in the Strafford region, and in each respective region across the state.

Exhibit 33 – Telephone Pole Broadband Attachment
Source: SWRPC

Power Transmission

Power Distribution

Fiber

Cable

Telephone



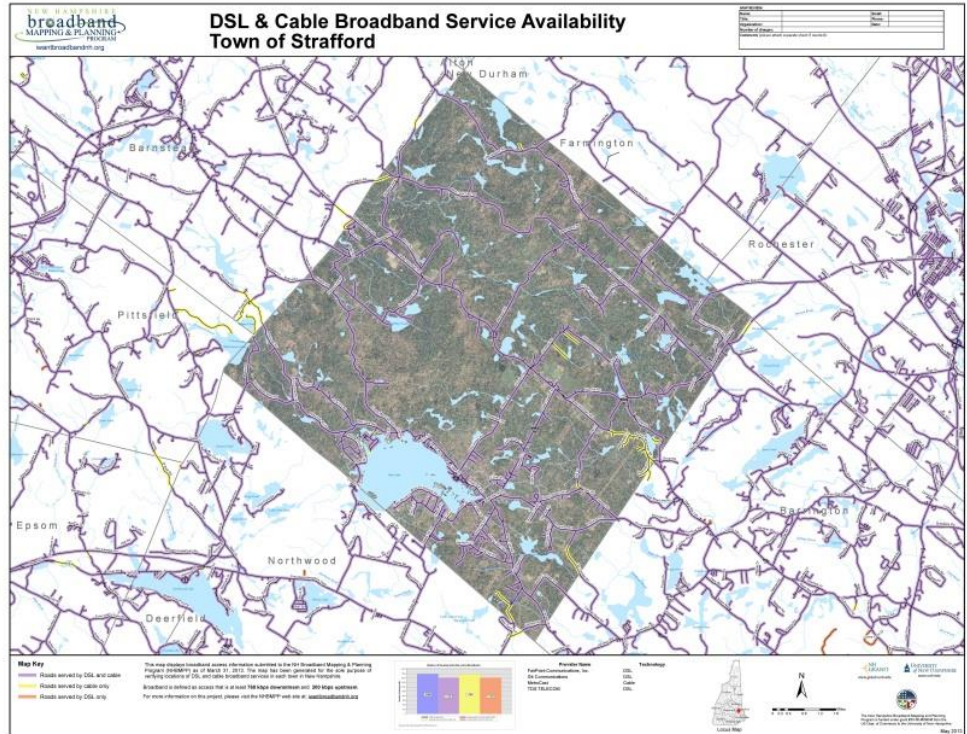
Mapping Verification Fieldwork Results

Exhibit 34 – Mapping Verification Results
source: SRPC

To the right is an example of the input and result of the mapping verification process, from meeting with appropriate contacts to performing field-verification of data.

The map on the top is an original copy received from the University of New Hampshire, displaying cable and DSL coverage. The copy below is the map post-field verification, completed following a meeting with municipal staff.

Road segments marked in the color red, are those areas where UNH data indicates service coverage but either our mapping verification contact, or the results of our field verification, indicated otherwise. Segments highlighted in green are those where no service was shown in the original data, but service was either field-confirmed or confirmed via our contacts. All general comments were recorded in black. Typically, these indicate the areas where field-verification confirmed the accuracy of the original data.



Community Anchor Institutions

As a component of the Mapping Program, SRPC, gathered broadband data on quality, cost, and penetration for over 3500 establishments designated as Community Anchor Institutions (CAIs) across the Strafford region. CAIs provide services and goods that are vital to community health. Examples include: public libraries, local schools, hospitals, local government centers, healthcare facilities, and other community-support buildings.

Data from community anchor institutions were gathered from 2009-2014. Initial research included determining the spatial location and contact information for each CAI. SRPC staff then completed surveys of each CAI, following a standardized protocol to determine the level of broadband access.

This process was completed by each of the nine Regional Planning Commissions, resulting in a statewide database of community anchor institution connectivity. This information is currently available through the GRANIT Data Mapper at: www.iwantbroadbandnh.com.

Data Collected:

- Broadband Service Presence
- Transmission Type (Type of Connection)
- Public Wi-Fi Network
- Service Provider
- Website Address
- Advertised Download and Upload Speeds
- Delivered Download and Upload Speeds
- Cost of Services
- Presence of Bundled Service
- Need for Higher Quality Service
- Contact Information
- Spatial Location

Major Regional Employers

Major regional employers in the Strafford Region are critical to the economic vitality of the area. There are many factors that draw business to the region, and it is important for these to be recognized and improved on in order to encourage further regional expansion of local, national, and international business. Broadband access and internet speeds are one such amenity that is a necessity for such businesses. In order to encourage employers to expand to and maintain a presence in the region, broadband speeds and services must be more than adequate

Some of the regions employers are highly specialized manufacturers of the latest technologies for the aerospace industry, defense, health care, and education among others. These companies require the newest technology to run machinery, control building environment, fabricate parts, and run computers for staff.

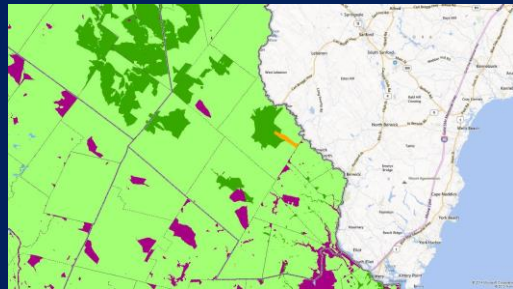


NHBMPP on the Web

For more information about the New Hampshire Broadband Mapping and Planning Program, Data Collection Efforts, and Planning resources for communities please visit: [iwantbroadbandnh.org](http://www.iwantbroadbandnh.org)

NHBMPP Data Viewer

To view the data, click [here](#).



Broadband is a necessary resource to keep these companies running efficiently and in turn ensure employee retention. Strafford Regional Planning Commission has determined the major employers in the region, and is in the process of gathering information on broadband access. The employers were contacted by phone and email to complete brief surveys addressing broadband providers, cost, access, and speeds. Although only a few companies have completed the survey thus far, SRPC is interested in maintaining contact with other regional employers to better understand the status of broadband in the region



Photo Credit: Turbocam



Major Regional Employers Survey Response Sample

Business: Turbocam

Address: 607 Calef Highway, Barrington, NH

Broadband Service: Yes

Internet Provider: BayRing and Metrocast

Type of Technology: Fiber

Actual Upload Speed: 30 Mbps

Actual Download Speed: 30 Mbps

Do you expect your business will need faster internet speeds in the next 2 years? 5 Years? 10 Years? : Yes

Barriers, Needs, and Opportunities



Barriers

From the regional broadband overview presented above, several key barriers to access expansion should be discussed. Considering possible obstructions beforehand is critical for finding solutions will help to identify factors that will lead to more effective expansion of broadband access in the region. Increased broadband access has substantial opportunities to offer – discussed in the next section – but before the region can benefit from them, several factors will need to be addressed.

Broadband Access and Economics in New Hampshire's Rural Landscape

While the majority of the region's population has access to broadband, this is concentrated in the larger towns and cities near the seacoast. Much of the rural landscape is "underserved", or completely unserved (SEE FIG_-Chart P.17 Exhibit 34 below). The NH Broadband Mapping and Planning Program defines "underserved" as those areas with connections boasting download speeds of 768 to 3 Mbps and upload speed between 200 Kbps and 1.5 Mbps.

Rural towns are at a disadvantage for increasing broadband access for several reasons. First, large distances between urban centers mean high installation costs, and low population densities mean low return on investment for the few corporate internet service providers (ISPs) which currently dominate the market. Additionally, research suggests that those private residents who are "underserved" or unserved either do not feel the need for greater internet speeds or do not feel the need for internet access at all (see Regional Demand for Broadband Section above).

Local economics and regional geography are also major barriers to the expansion of municipal broadband. Small towns have small budgets, and they likely don't have the capital for major Wi-Fi or fiber optic installations. High installation costs from services providers result primarily from greater distances from central distribution points and the heavily forested and undeveloped landscape. At first glance it would seem that high costs and low consumer interest would halt any discussion of broadband expansion into rural areas.

While rural residents may not feel the need for high-speed internet at home, they can benefit from enhanced community services that can come from greater broadband access at the local level. As discussed further below, the efficacy and connectedness of community services such as public safety, healthcare, schools, and government can be increased significantly through broadband access. The barriers discussed briefly above are substantial – but not insurmountable – and certain information will be required for effective planning. Community Anchor Institutions (CAIs) and the local services they provide are the vital link for bringing the benefits of broadband access to rural communities. Bringing broadband connections to CAIs such as fire and police stations, businesses, libraries, and healthcare centers will result in economic and social benefits for the entire community. Information about CAI's specific needs will be necessary for implementation.

One such approach is being implemented by the New Hampshire FastRoads project, which has begun connecting Western NH communities through an open access, fiber network (newhampshirefastroads.net). The project will be installing "middle mile" fiber optic cable connecting CAIs in 22 Southwest NH communities – from Rindge and Fitzwilliam near the Massachusetts border, to Orford north of Hanover.

Needs

Specific information and community collaboration are needed before any planning for broadband expansion in unserved or underserved areas of the Strafford region can be implemented. Effective planning for broadband expansion requires a specific understanding of how broadband access can be applied to challenges at the local level. CAIs' can be a valuable source for information about community needs – are there local institutions (e.g. fire/police, schools, public works) that see a need to enhance their services? After community-level needs have been assessed, detailed knowledge of the topography and existing rights-of-way between communities will also be critical for planning effective routes that will bring broadband access to the greatest number of people. Some education about broadband may be needed, but effective local education efforts will primarily stem from working with CAIs that have an immediate need for increased broadband access.

Building partnerships and collaboration within and among communities and CAIs will be essential for any wide-scale efforts. Several factors are needed for building collaboration. Information about grant opportunities for regional rural telecommunications development may be critical for funding such large projects (this will be addressed further in the implementation section). It could also be beneficial to form public/private partnerships in order to collaborate on projects and finding opportunities for improving broadband in the region. There is also a need for improved collaboration with state's Internet Service Providers to improve the precision and availability of data to understand where individuals are served, underserved, or unserved.

State legislators have begun considering funding assistance tools which could help communities in the future. A bill was recently proposed by the State legislature to allow for the bonding of broadband infrastructure for the purpose of creating networks to provide affordable and universal broadband access. Policy for facilitating public ownership of broadband/telecommunications infrastructure could provide significant benefits to municipalities. For instance, public ownership of overhead utility poles could increase competition between ISPs and reduce user costs. This would require education and technical assistance from lawyers and planners on model telecommunication facility ordinances as well as Cable Franchise document construction.

Municipal cable franchising agreements often make geographic boundaries into service barriers. As a result, a need for incentivizing Internet Service Providers (ISPs) to compete against one another in franchised communities presents itself. There is also a need for increased diversity of service providers. This may require the streamlining of co-location acquisition process from owning provider to other providers. The promotion of broadband as basic infrastructure in communities akin to sewer and water, would also aid in encouraging increased broadband infrastructure and usage.



Connecting Communities

This toolkit is designed to aid communities in their efforts to create broadband connected cities and towns. These materials are to be used to help communities in implementing projects to improve broadband access, usability, and for social and economic improvements.

This program was developed by a group of professionals from Penn State, Pennsylvania University, University of Minnesota, and others.

Their website includes all their resources and is a great starting place for local officials to get information concerning the state and potential expansion of broadband internet.

Check it Out!

<http://srdc.msstate.edu/ecommerce/curricula/connectinacommunities/>

Opportunities

Healthcare

Healthcare is an extremely important issue in the United States today. With the recent launch of the Health Insurance Marketplace and the signing of the Affordable Care Act in March, 2010. Americans are concerned with finding healthcare plans that not only fit their needs, but that are affordable as well. The utilization of broadband in the healthcare field may allow for more efficient and less costly procedures and practices, which benefits end users in the long run. In *Connecting America: The National Broadband Plan*, Health IT is viewed as playing a key role in the advancement of policy priorities that can and will improve health and healthcare delivery (FCC, p.200)

Telehealth is a term that has emerged in the latter half of the 20th century and both telehealth and telemedicine are becoming increasingly more prevalent in today's society.



Source: Alex Proimos

Voalte

Voalte, an iOS based application, allows for communication between medical staff within large facilities and hospitals. Operated within a secure internal network, the application allows for nurses and doctors to communicate instantly via either text message or phone call. Contact group assignment allows for instant large-scale messaging. Additionally, status indicators from each Voalte activated device identify the current status of the device-carrying employee, such as "busy" or "available". Voalte also gives users the capability to create a predefined quick-message dictionary with unique facility or department codes for various medical situations or emergencies.

Telehealth is defined by the U.S. Department of Health and Human Services as the use of electronic information and telecommunications technologies to support long-distance clinical healthcare, health-related education, public health, and health administration. There are many benefits of telehealth related with the applications and uses broadband makes available. For instance, doctors can now connect remotely with their respective offices and hospitals to be able to provide information and guidance concerning their patients when there is an emergency and they are not able to be present immediately. The way information is stored and processed is changing as well. Resilient and redundant broadband networks allow for the secure transfer and tracking of patients medical records through Electronic Health Record (EHR) systems.

Electronic Health Records

Electronic Health Records include patient's medications, tracking of their orders, their referrals, links to their hospital labs, patient results from such labs, and closing out of orders. This filing system allows instant facility-to-facility transfer of vital medical information. Different from Electronic Medical Records (EMR), which contains medical and clinical data from only one provider, an EHR contains information from multiple providers that is compiled.

Online Patient Portals

Many healthcare providers now offer online patient portals that allow patients to not only book appointments online, but also fill out forms before an appointment, access their medical record information, or even request medication refills.

Education

Advances in technology have greatly affected education and how students learn. Computers have become an essential component of classrooms in the United States and thus adequate broadband is also essential. Thousands of applications and programs designed to aid teachers and students – both in, and out, of the classroom - are available online. Broadband access can also aid in school administration. For instance, a network of fiber lines between schools in a district would allow for faster and more proficient service for multiple educational institutions. In terms of funding for speedier, more resilient and redundant broadband networks, there are options other than having towns set aside specific broadband funds. The E-Rate program, based on the amount of free and reduced lunches in a school, allows qualifying schools to apply for funding for broadband technology improvements.

Broadband also has an obvious role in higher education

with the abundant options for online classes and degree programs that are available today. It is essential that students and professors have secure and reliable broadband connections to allow for viewing of online materials and participation in such classes. Use of online platforms such as Blackboard also require adequate broadband and allow students and teachers to stay connected through posting and submitting of online readings, assignments, quizzes, tests, and discussion assignments. Students both in college and in primary education have also began using iPads and similar technology to enhance their learning experiences. These uses and applications all highlight the need for reliable broadband connections for the schools in our region. Judging from the results of the Community Anchor Institution database, an effort to identify and gather data on broadband accessed by the schools in the region, there is room for improved broadband services.



Source: Sage Ross

Skype/Video Conferencing

Skype, and other video conferencing programs, allow communication between individuals that may have information to share, but may not be able to make it to the classroom to do so. In the Strafford region, video conferencing is already being used to bring home-bound children and students back to the classroom, share in lectures from guest speakers half way around the globe, and help professionals take the next step in their education and training from the comfort of their homes and workplaces.

Learning Management Systems

Learning management systems, such as Blackboard and Moodle, can be used as a command center for students to access learning games and applications, access and submit materials both inside and outside of the classroom. They can also assist faculty in payroll functions, administrative functions, and even grading.



Smartphones and Tablets

Tablets and smartphones are transforming the classrooms of today as we speak. Applications or "Apps" allow students and teachers instant and anytime access to the internet as well as the resources discussed within this section. Because of their compact and discrete profile, as well as mobility, these devices have already begun to outnumber the number of non-mobile devices globally.

Public Safety

Information is critical in the public safety sector and broadband allows for the rapid transmission of detailed information. For instance, the transmission of information via an Intelligent Management System (IMS) would allow for the quick and efficient supply of information for police officers and other safety officials. This type of technology could be used to create county and even statewide networks that allow police officers to access criminal records outside of their municipality, and therefore be more prepared when doing their job. The infrastructure for this type of system needs to be created for the application of such technology to occur.

With the threat of natural disasters and other emergencies, redundancy and resiliency are also extremely important. The middle mile microwave network currently being installed across the state allows for this redundancy and resiliency as it is connected to fiber in four locations across the state. This effort to ensure these reliable networks is currently being completed as a component of the Network NH Now project (Exhibit 36). This closed network provides access for public safety, public television, transportation, and mobile broadband communications across New Hampshire. The cell towers which transmit the network signal can then be used for communication during emergency situations, via social media on mobile broadband devices, or via the transmitting of signals to other mediums. This also highlights why it is essential for public safety officials and agencies to create a social media presence before the occurrence of such events.



Source: Dave Conner

Code Red

Code Red sends out calls to all home and cell phone numbers within a given area with information about emergencies. A public safety facility running the application can set a physical area of coverage and send a pre-recorded message during a disaster or emergency.

E-Dispatch

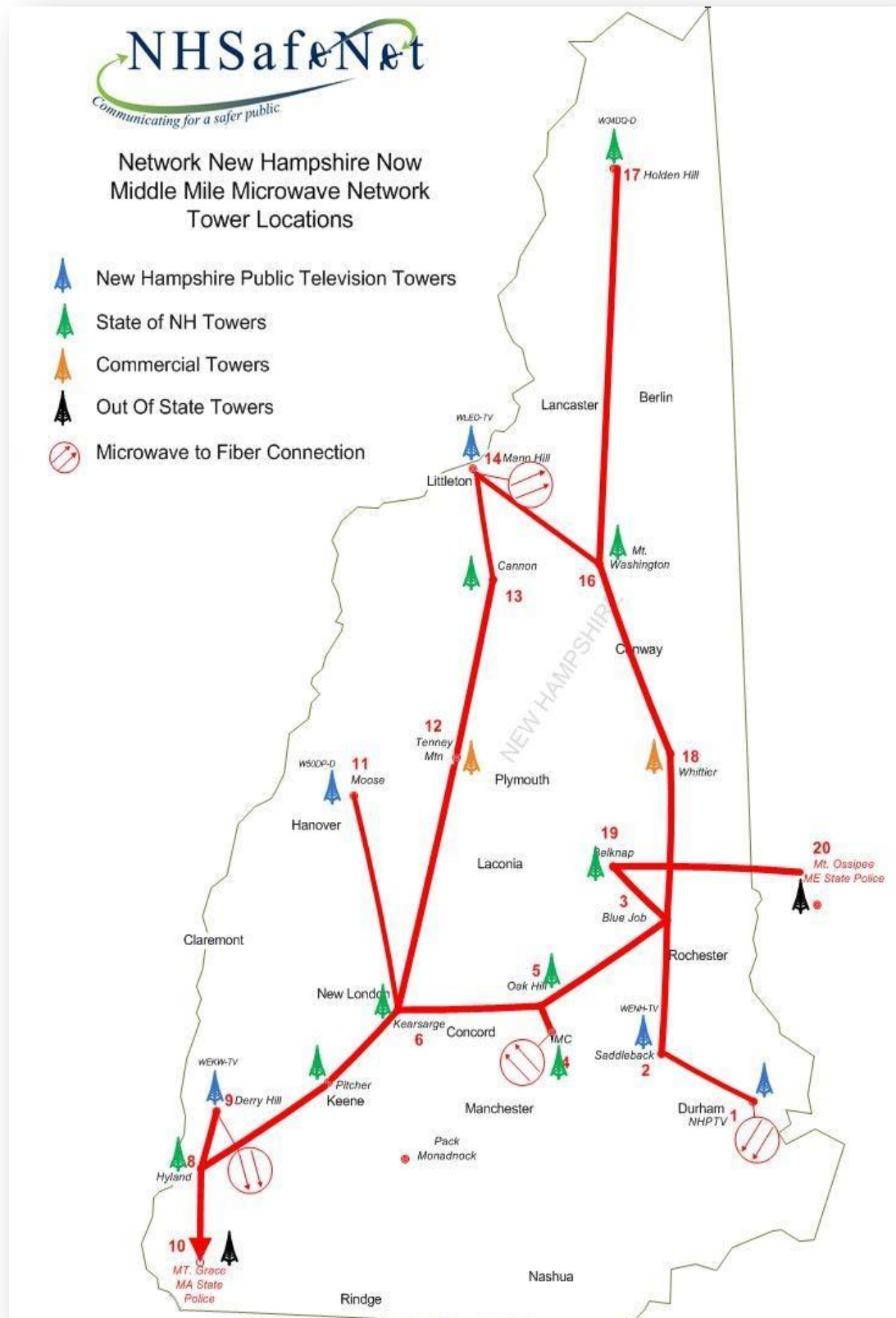
E-Dispatch is an application that sends out emergency response 'tones' via iOS devices. It operates via a base station, where the tones are received through a broadband connection. The tones are then sent from the base station to a smart phone with the application. Emergency response personnel can now choose to carry only one device rather than a smartphone and a pager.

Facebook

Facebook has become a powerful tool in law enforcement. In a recent survey released by LexisNexis Risk Solutions, four out of five respondents (out of 1,200 Federal, State, and Local Law Enforcement Professionals surveyed) use various social media platforms to assist in investigations. Social media investigations were referenced by law enforcement during the sector-based interview process:

People will post things on Facebook that we can use in our investigations. We can access this information by utilizing the enforcement log in option on Facebook. Also, a common strategy is to make a false profile and friend individuals. It is common for everyone to friend everyone on Facebook. Here, Facebook becomes a very useful tool and an individual's profile can be used as evidence in police investigations. – Wakefield Chief of Police

With the growing threat of extreme weather due to change in climate, resilience is a critical factor in community preparedness, emergency response, and recovery from disasters. Redundant and resilient broadband infrastructure is critical in ensuring community connectivity during extreme weather events. The Network New Hampshire NOW project is implementing such infrastructure with creation of a microwave network for television, public safety, and transportation communications(Appendix).



Local Government

Broadband provides a powerful communication tool for local government. Municipalities could create their own network whether via fiber, or some other transmission method. Communities could also install downtown Wi-Fi networks that can be utilized by residents and visitors and help local businesses grow. Redundancy and resiliency are important in insuring local government is able to function effectively. As mentioned previously, the middle mile microwave network allows for this redundancy and resiliency as it is connected to fiber in four locations across the state. Access to this allows for communication during emergency situations, via social media on mobile broadband devices, or via the transmitting of signals to other mediums. Local Government can also take advantage of such tools.

Broadband planning on a municipal level could allow towns and cities to better understand the broadband infrastructure needs in their respective communities. Planning can take several forms: A broadband planning chapter could be added to community master plans, revisions could be made to town ordinances and regulations, as well as participating in training offered by organizations like UNH Cooperative Extension. They currently offer training called "3 Free ways to Promote Your Town/City via the Web". Use of organizations such as SRPC could also be useful to local governments in terms of technical assistance for application of grant funds for broadband and broadband related applications.

Newmarket Downtown Wi-Fi

Cases of successful municipal broadband implementation can provide guidance for future action in other towns. SRPC held its quarterly Broadband Stakeholder Group Meeting in February 2013 alongside representatives of the Newmarket Business Association, which enacted a free downtown public Wi-Fi system beginning in 2009. With the combined efforts of the Newmarket Business Association, the Newmarket Community Development Corporation, and the Town, Newmarket began providing free wireless internet to the public in range of the downtown signal.

The decision to create a downtown network stemmed from availability of grant funds, as well as enthusiasm from the Town and local organizations to have a free public Wi-Fi network. Currently, there are five points of connectivity for users, combining to form one large zone covering Newmarket's entire downtown district. This network is extremely successful, due in part to the efforts of community organizations like the Newmarket Business Association, and members like Rod Ricard, Mike Hoffman, and Rod Bowles. Ricard, who owns his own computer service store Geek To You, handles day-to-day maintenance of the network. For the organizations that made the network possible, the hope is that the continued use of the service will encourage residents to live local by being able to work from home, shop in the area, and as a result better the local economy.

With the prominent example Newmarket has provided, other communities can see the effects broadband internet can have in catalyzing growth of a vibrant downtown-oriented community. To learn more about the Town of Newmarket, visit www.newmarketnh.gov/.



Source: SRPC Staff

Economic Development

With the reliance on technology by today's businesses, broadband has a large role in economic development. The internet is required for social media marketing, email, and many other communication functions in the business world. UNH Cooperative extension recognized this factor, and has created trainings about broadband and the economic impacts for NH. Similar to local government benefits of having a downtown Wi-Fi network, the economic development sector could also benefit from this type of network. This would allow not only the businesses themselves to connect to broadband, but the customers as well. Considering that the University of New Hampshire is located in our region, students can especially take advantage of a free Wi-Fi network, encouraging business at local coffee shops, restaurants, book stores etc.



Economic Development – UNH Cooperative Extension Trainings

As part of the NH Broadband Mapping and Planning Program (NHBMPP), UNH Cooperative Extension has created training programs explaining broadband and its countless applications and benefits for the State of New Hampshire. Below are two trainings that are currently being offered concerning economic development in the state.

Broadband, Why Care? – Leveraging Broadband to Grow New Hampshire's Economy

This training offered as a recorded module on YouTube explains the connection between Broadband and economic development in the State. This brief training begins by defining Broadband and the capacity of its various speeds. Broadband's role in growing NH's economy is then discussed, followed by the technology and training needs expressed by government, small businesses, and institutions across the state.

<http://nhcitizenplanner.org/content/broadband-new-hampshire>

Putting Your Business on the Digital Map

This training can be in-person, or offered online. Attendees will complete this training having an understanding of innovative marketing involving GPS and smartphones. They will also gain the necessary skills to add their business info to numerous databases and maps that customers can access from GPS and smartphone applications. Lastly, they will be able to maintain and update this information in those important databases.

In order to encourage employers to expand to and maintain a presence in the region, broadband speeds and services must be more than adequate. Some of the region's employers are highly specialized manufacturers of the latest technologies for the aerospace industry, defense, health care, and education among others. These businesses require the newest technology to run machinery, control building environment, fabricate parts, and run computers for staff. Broadband is a necessary resource to keep these companies running efficiently and in turn ensure employee retention (Appendix).

Residential

There are 146,895 individuals in the Strafford region.^{xxxviii} Of these 146, 895, the majority of individuals have access to broadband internet. In a survey conducted by the UNH Survey Center, it was found that only 9% of the total statewide respondents interviewed did not have broadband service. Of over 350 individuals interviewed in the region, 12% reported that they did not have broadband internet access. The reasons as to why were explained and are displayed in Exhibit 36. The regional and state answers vary slightly. A third of Strafford Regional respondents who do not have internet cited it as unnecessary.

To understand the extent of broadband service for regional residents, a mapping verification program was conducted as part of the project and completed during summer 2013. This effort allowed maps showing broadband coverage to be examined by town officials, and for field work to check for the presence of broadband on telephone poles in questionable areas.

When conducting research into the barriers, needs, and opportunities for broadband in the region, focus interviews provided insight in differing professional sectors including healthcare, economic development, local government, public safety, and education. Each interviewee was not only asked to address broadband in a professional sense, but in their experiences as a resident as well. Many individuals seemed to have adequate internet for their at home uses. Personal uses included surfing the web, as well as the use of services such as Netflix

Barriers to service included the price of adequate service, as well as slower speeds when using the internet after getting home from work. This was often attributed to the amount of other users online at the same time. Interviewees also mentioned storms causing the internet to go down as a problem. From the input received, it seems that the barriers outweigh the needs, especially in terms of faster speeds, as residents don't seem willing to pay more for faster speeds.



Cable Franchise Agreements

In 2012, the NH Broadband Mapping and Planning Program (NHBMPP) completed an inventory of all the cable franchise agreements in the state. Cable Franchise Agreements are required by NH RSA 53-C and require each community to enter in to an agreement to access cable and decide terms for that access. In the state of New Hampshire, this limits competition of providers in communities as there is only one primary provider per community.

While this agreement doesn't include internet access, most providers offer broadband service as well, which is often bundled with cable service. The data and agreements provided in the database created by the RPCs and their partners, is one that has been continually updated throughout the timeline for the NHBMPP project.

The database of agreements can be found on the iwantbroadbandnh.org/cable-franchise-agreements.

Implementation

Expanding broadband technology throughout the region and ensuring communities can take full advantage of its potential is an effort that is just beginning. It will require collaboration between stakeholders at local, regional, and state levels. It starts with a straightforward legal framework that focuses support on local implementation and does not limit potential benefits. At the state level, the development of enabling legislation is still in the early stages. Collaboration between municipalities, regional decision-makers, and legislators will help develop a supportive implementation framework.

While the state has an important role, the majority of work will take place between regional and local partners. At this stage, initial implementation efforts at the local level will primarily involve capacity building through technical assistance, outreach, and education. Work between planners and local stakeholders (e.g. municipal governments, schools, and businesses) will focus on promoting broadband benefits, obtaining needed data, identifying funding sources, and building partnerships. Collaboration between municipalities and internet service providers will be essential for identifying common interests and ensuring delivery of services.

Exhibit 36, on the next page, provides a detailed matrix of suggested implementation strategies. It includes recommendations for prioritizing and timing, sector relevance (e.g. Education, government, residential) and scale (local, regional, or state). The plan goals are also reiterated below as a reference point for implementation strategies. For reference, the table below is a key to understanding the symbology within the implementation matrix.

Matrix Key

Priority Rating	Phase	Level of Action	Functional Areas	Notes:
High= high impact & feasibility	Short = < 1 yrs.	● Primary level of action	● Primary Functional Area Affected	This field can contain general notes of fiscal impact
Medium= moderate impact or feasibility	Med = 2-4 yrs.	○ Secondary level of action	○ Secondary Functional Area(s) Affected	
Lower=lower impact and feasibility	Long = >4 yrs.			
	Ongoing			

Plan Goals

Address the digital divide through the implementation of training programs aimed at increased digital literacy and technological adoption among underserved and unserved populations

Continue to implement innovate broadband technologies and applications as part of their intelligent transportation system suite of the region's transportation networks

Ensure Healthcare, Public Safety, Education, and other Community Anchor Institutions have access to broadband speeds of 100mbps via redundant and resilient networks

Create a redundant and resilient statewide communications network for use by Public Safety and Local Government entities

Promote public/private investment in tomorrow's broadband infrastructure, technologies, and applications to ensure the continued economic and social prosperity of the region's citizens

Attract broadband-based business to the region via the creation of focused training programs that increase economic growth and competitiveness by emphasizing the development of a skilled workforce

Identify and prioritize strategic recommendations, goals, and performance measures over terms of One (1), Three (3), and Five (5) years, as part of this plan's implementation timeline

Increase access to and transparency of local government through investment in e-government applications that provide valuable information and services to citizens, visitors, and businesses

Exhibit 36 – Implementation Table

Priority Rating	Phase*	Strategy	Level of Action*	Relevant Sectors*						Potential Partners	Notes*
				Economic	Education	Government	Health	Public Safety	Residential		
High	Short	Expand and develop education programs focused on leveraging broadband technology by promoting workshops or trainings that target community leaders and stakeholders.	<ul style="list-style-type: none"> ● Local ● Regional ○ State 	●		●		○		UNH Cooperative Extension; NH Municipal Association	Offer UNH Cooperative Extensions trainings to our municipalities. I.E. Broadband-Why Care; Leveraging Broadband to Grow New Hampshire's Economy & Putting your Business on the Digital Map. Minimal investment anticipated.
	Short	Work with the NH Municipal Association and DRED to promote or sponsor education, trainings, and other opportunities focused on broadband capacity building for municipalities.	<ul style="list-style-type: none"> ● Local ● Regional ○ State 	○		●		○		NH Municipal Association, UNH Cooperative Extension, Department of Resources and Economic Development, municipalities	Minimal investment anticipated.
	Medium	Promote the development of municipal telecommunications or broadband committees: development of how-to guide for establishing committees, allocating resources to assist committees, etc.	<ul style="list-style-type: none"> ● Local ● Regional ○ State 	○	○	●	○	○	○	RPCs, municipalities, and Town Officials.	Moderate investment anticipated.
	Ongoing	Develop web-based clearinghouse of NHBMPP products, information, reference materials, & meeting minutes, etc. for decision makers and stakeholders.	<ul style="list-style-type: none"> ● Local ● Regional ○ State 	●		●			○	RPCs and UNH Granit	Building upon efforts of iwantbroadbandnh.org . Migration of all data and materials into regional clearinghouse. Substantial investment anticipated.
	Short	Development of broadband infrastructure component in SRPC Regional Master Plan.	<ul style="list-style-type: none"> ○ Local ● Regional 	○	○	●	○	○	○	RPCs, Broadband Stakeholder Groups, Regional Master Plan Advisory Team	Substantial investment anticipated.



Exhibit 36 – Implementation Table

Priority Rating	Phase*	Strategy	Level of Action*	Relevant Sectors*						Potential Partners	Notes*
				Economic	Education	Government	Health	Public Safety	Residential		
Medium	Short	Encourage legislators to support amendments addressing municipalities' abilities to bond for broadband infrastructure construction and improvements.	<ul style="list-style-type: none"> ○ Local ● Regional ● State 	○	○	●	○	○	○	Legislators, municipalities, town officials, regional decision makers	Currently HB 286, proposes bonding of broadband infrastructure by municipalities. Moderate investment anticipated.
	Medium	Conduct regional audit of local land use regulations and ordinances in an effort to identify barriers to broadband development and expansion.	<ul style="list-style-type: none"> ● Local ○ Regional 			●			○	Municipalities and Town Planners	Moderate investment anticipated.
	Medium	Development of model broadband chapter for use by communities in master planning efforts.	<ul style="list-style-type: none"> ● Local ● Regional ○ State 	○	○	●	○	○	○	Municipalities, Town Planners, RPCs	Moderate investment anticipated.
	Short	Presentation of SRPC Broadband Plan to regional communities.	<ul style="list-style-type: none"> ● Local ● Regional ○ State 	○	○	●	○	○	○	Municipalities and Town Officials.	Minimal investment anticipated.
	Medium	Promote establishment of dedicated funds for broadband development, expansion, and improvements at the municipal level.	<ul style="list-style-type: none"> ● Local ● Regional ○ State 	○		●		○		Municipalities and Town Officials.	Minimal investment anticipated.
	Ongoing	Support and facilitate implementation of Public/Private Partnership driven downtown Wi-Fi networks	<ul style="list-style-type: none"> ● Local ● Regional 	○		●			○	Municipalities, Town Officials, Town Planners, Local Business Stakeholders, BSG Members	Minimal investment anticipated.



Exhibit 36 – Implementation Table

Priority Rating	Phase*	Strategy	Level of Action*	Relevant Sectors*						Potential Partners	Notes*
				Economic	Education	Government	Health	Public Safety	Residential		
Medium	Ongoing	Develop guidance document for use by communities when negotiating a Cable Franchise Agreement. Continue updates to web-based Cable Franchise Agreement database.	<ul style="list-style-type: none"> ● Local ● Regional ● State 		○	●		○	○	New Hampshire Coalition for Community Media, Municipalities, Cable Franchise Agreement Boards, and Town Officials.	Cable Franchise Agreement database is available at iwantbroadbandnh.org . Moderate investment anticipated.
	Medium	Explore alternative and expanded data collection efforts of spatial broadband infrastructure by collaborating with state, local, and industry partners to improve the public dataset.	<ul style="list-style-type: none"> ● Local ● Regional ○ State 	○		●				Internet Service Providers, Municipalities, and State and Local partners.	Moderate investment anticipated.
Lower	Medium	Collaboration with school districts to encourage expanded access to affordable broadband technology/ high speed internet for students.	<ul style="list-style-type: none"> ● Local ● Regional 	○	●	○	○	○	○	Regional SAUs; Internet Service Providers	Moderate investment anticipated.
	Short	Develop fact-sheet that can be easily distributed to communities and stakeholders.	<ul style="list-style-type: none"> ● Local ● Regional ○ State 	●	○	●	○	○	○	N/A	Minimal investment anticipated.
	Medium	Improve collaboration with the Broadband Center of Excellence.	<ul style="list-style-type: none"> ● Local ● Regional 							UNH Broadband Center of Excellence	Minimal investment anticipated.
	Long	Encourage inclusion of broadband in hazard mitigation or recovery planning efforts.	<ul style="list-style-type: none"> ● Local ○ Regional 			●		●		Town Planners and Municipalities	Moderate investment anticipated.



Conclusion

High-speed internet access is a powerful tool that is fast becoming as vital as electricity. It has the potential to improve economics, public health and safety, governance, and education at the local level and throughout the Strafford region. Most of the region is serviced with adequate broadband access – particularly the well-developed cities and towns near the seacoast – but more rural towns have significant areas where internet access is limited or unavailable. Unless planners and decision-makers work to change this, as populations increase and broadband access becomes a critical factor in community development, the observed disparity between developed and rural parts of the Strafford region will only increase. Broadband access is still a relatively new issue at a local planning level (none of the Strafford region communities mentions broadband development in their master plans), but healthy growth and economic development in the 21st century will depend heavily on access to high-speed internet.

Mapping efforts and engagement with stakeholders about improving broadband access have revealed important information about planning and implementation challenges. Low competition between existing internet service providers, as well as the undeveloped landscape and limited economies of rural towns are among the primary challenges facing regional and statewide efforts to improve internet access in underserved and unserved communities. Statewide surveys imply generally that residents who have at-home internet access are satisfied with their level of service (and unlikely to pay more for upgrades), and most residents without it have personal reasons other than a lack of access through service providers. These research efforts suggest that a community-based approach – rather than focusing on individual access – may be more effective for improving broadband access in rural areas of the Strafford region. Expanding broadband access and capacity at community anchor institutions can help small businesses grow, improve local healthcare, schools, and public safety, and support a greater sense of community.

Effective planning and implementation will require collaboration among stakeholders at state, regional, and local levels. At these early stages in broadband planning technical assistance, education, and outreach will be at the forefront. Effective and timely implementation will depend – in part – on collaborative relationships among municipal governments, internet services providers, community anchor institutes, and other relevant stakeholders. Statewide legislation is also needed to establish consistent standards for implementation that enable towns and cities to take full advantage of broadband's potential.

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