PLANNING & ASSISTANCE

MAPPING

Broadband Plan
for the

Southern NH Planning Commission Region
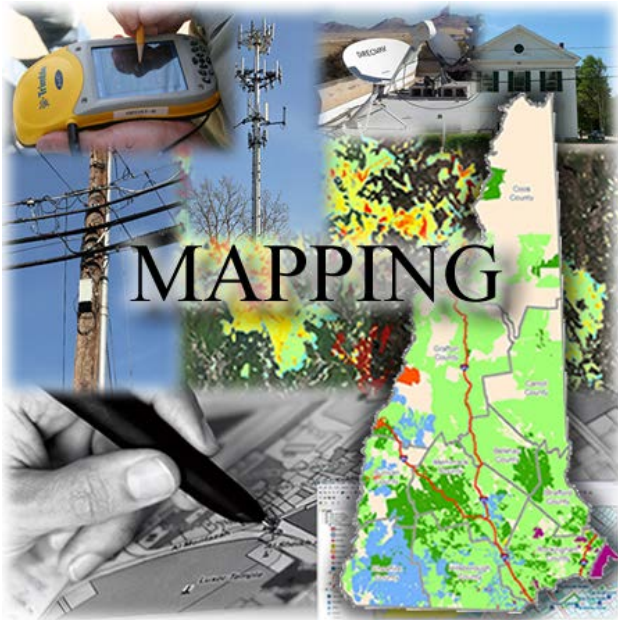
NEW HAMPSHIRE
SOUTHERN PLANNING COMMISSION
SNHPC

Adopted by the Planning Commission on March 25, 2014

NEW HAMPSHIRE
broadband
MAPPING & PLANNING
PROGRAM

RECOVERY.GOV NTIA NEW HAMPSHIRE O E P OFFICE OF ENERGY AND PLANNING NH GRANIT UNIVERSITY of NEW HAMPSHIRE

(This page is intentionally left blank)

(This page is intentionally left blank)

Acknowledgements

The Southern New Hampshire Planning Commission would like to thank all the members of the Broadband Stakeholders Group (BSG) who provided their valuable time and assistance to this project, as well as their guidance in bringing this plan to completion.

Broadband Stakeholders Group Members

Jennie Angell, Director, Information Services, City of Manchester

Deborah Boisvert, Technology Coordinator, Deerfield School District

Gent Cav, President/CTO, G4

Eric DeLong, IT Director, Town of Windham

Ron Fredette, Managing Director, KW Commercial

Susan Rand King, President, Granite State Communications

Mike Koustas, Fiber Design Manager, Waveguide

Michael Lawler, Attorney, Goffstown Representative

Stuart Lewin, New Boston Planning Board

John Meehan, Director of Sales, Waveguide

Matthew Mercier, President and Founder, Acapella Technologies

Carol Miller, Director of Broadband Technologies, NH DRED, Division of Economic Development

Brian Olsen, Business Development Manager, Emerson Network Power

Ingo Roemer, VP of Business Development, 186 Communications

Laura Scott, Community Development Director, Town of Windham

Will Stewart, Vice President of Economic Development & Advocacy, Greater Manchester Chamber of Commerce

Brian Tew, Catholic Medical Center, Information Director

SNHPC Municipalities & Commissioners

Town of Auburn
William G. Herman

Ronald F. Poltak

Charles M. Worster

Town of Bedford
Gregory A. Camann

David J. Danielson

William Duschatko

Paul Goldberg

Karen McGinley

David Wall

Town of Candia
Albert Hall, III

William Stergios

Town of Chester
Janet Boyden

Patricia Martin

Town of Deerfield
Frederick J. McGarry

Frances Menard

Town of Derry
Frank Bartkiewicz

Joseph Donahue

John O'Connor

Darrell Park

Town of Goffstown
Henry C. Boyle

Jo Ann Duffy

Barbara J. Griffin

Anthony Marts

David Pierce

Town of Hooksett
Robert Duhaime

Michel N. Jolin

Richard G. Marshall

Town of Londonderry
Sharon M. Carson

Deborah Lievens

Leitha Reilly

Arthur E. Rugg

Martin Srugis

City of Manchester
Elias Ashooh

Peter D. Capano

Raymond P. Clement

Robert MacKenzie

Daniel P. O'Neil

Town of New Boston
Brent Armstrong

Stu Lewin

Harold Strong

Nic Strong

Town of Raymond

Town of Weare
Terry Knowles

Ian B. McSweeney

Town of Windham
Carl Griffin

Peter Griffin

Ruth-Ellen Post

Eileen Mashimo

Mark Samsel

SNHPC Staff

David J. Preece, AICP	Executive Director
Jack Munn, Jr., AICP	Chief Planner
Jillian M. Harris, AICP	Senior Planner
Timothy H. White, AICP	Principal Transportation Planner
Jihong "Julie" Chen, Ph.D.	Senior Transportation Planner
Adam Hlasny	Transportation Planner
Pamela H. Garrity	Planning Technician II
Patrick Blaisdell	Planning Technician I
Amy M. Kizak	Senior GIS Analyst
Linda Moore	Office Administrator
Linda Shinn	Financial Administrator
Derek Serach	GIS Analyst
Daniel D. Snyder	Planning Intern
Katrina Crocker	Planning Intern
Kellie Walsh	Planning Intern

Acronyms

ACS	American Community Survey
BPL	Broadband over Power Line
BSG	Broadband Stakeholders Group
BTOP	Broadband Technology Opportunities Program
CAI	Community Anchor Institutions
CEDS	Comprehensive Economic Development Strategy
CFA	Cable Franchise Agreement
DSL	Digital Subscriber Line
ED	Economic Development
FCC	Federal Communications Commission
Gbps	Gigabit per second
GIS	Geographic Information System
GRANIT	Geographically Referenced Analysis and Information Transfer System
GSF	Granite State Future
HD	High Definition (Video)
ISP	Internet Service Provider
IT	Information Technology
Kbps	Kilobit per second
Mbps	Megabit per second
NHBMPP	New Hampshire Broadband Mapping and Planning Project
NH DRED	New Hampshire Department of Resources and Economic Development

NH ELMB	New Hampshire Economic and Labor Market Information Bureau
NH ES	New Hampshire Economic Security
NH OEP	New Hampshire Office of Energy and Planning
NISP	Neighborhood Internet Service Provider
NNHN	Network New Hampshire Now
NSLP	National School Lunch Program
NTIA	National Telecommunications and Information Administration
PC	Personal Computer
PEG	Public, Educational and Government Access (Television Channels)
ROW	Right of Way
RPC	Regional Planning Commission
SAU	School Administrative Unit
SNHPC	Southern New Hampshire Planning Commission
TIF	Tax Increment Financing
UNH	University of New Hampshire
UNH CE	University of New Hampshire Cooperative Extension
USDA	United States Department of Agriculture
VPN	Virtual Private Network
Wi-Fi	Wireless Fidelity
WISP	Wireless Internet Service Provider

(This page is intentionally left blank)

Table of Contents

*Note: Refers to information that has been submitted for use in this plan by University of New Hampshire through the NH Broadband Mapping & Planning Program.

List of Figures

List of Tables

A. Executive Summary

The purpose of this regional plan is to provide a framework for broadband infrastructure development and planning within the Southern New Hampshire Planning Commission (SNHPC) Region. This includes raising awareness of the importance of broadband as an economic development goal including identifying underserved geographic areas and communities within the region which lack or are in need of enhanced broadband infrastructure, access and connectivity. Currently, all nine regional planning commissions are working with the University of New Hampshire (UNH) in developing broadband plans for each region of the state. Upon completion, all nine regional plans will be consolidated into a composite statewide broadband planning document.

High-speed internet has become the latest utility service transforming communities across New Hampshire as well as all across the world. Computers, mobile devices, and the internet have fundamentally changed the way people conduct business, socialize, and share information with millions of other users. Connecting every resident of New Hampshire to this network has become a significant economic development goal both at the state and national levels, and these efforts are yielding impressive results.

In 2010, according to the Department of Resources and Economic Development (DRED), New Hampshire was ranked second in the nation with a 73 percent broadband penetration rate. In March 2013, the state improved its penetration rate to 88 percent. In September of the same year, the penetration rate had increased to 96%.[1]

Akamai, a leading cloud-based platform that also develops quarterly "State of the Internet" reports based on the data it gathers from servers across the globe, identified New Hampshire in its 1st Quarter 2013 report as being ranked first in the nation for high-speed broadband connectivity and adoption at 40 percent over 10 Mbps and first for broadband adoption at 90 percent over 4 Mbps. Akamai also ranks New Hampshire second in the nation for average connection speeds with 12.1 Mbps and 4th in the nation for average peak connection speeds of 44.4 Mbps.[2]

While broadband is generally well-developed within the SNHPC Region, there are a few communities with isolated geographical areas and neighborhoods that are still underserved with limited broadband connectivity. These communities and neighborhoods are identified in this plan. In addition, it is a major finding of this plan that there are disadvantaged and marginalized populations consisting of refugees and low-income residents, including veterans and senior citizens residing in the SNHPC Region who are

---

[1] http://nheconomy.com/business-services/broadband-telecommunications/default.aspx (accessed March 6, 2014). It is important to note that these penetration rates are determined at a census block level and then averaged at a statewide level so the exact penetration rate varies considerably by geography (at the census block level) throughout the state. According to the Director of Broadband Technologies with the NH Division of Economic Development, these penetration rates do not mean that every household in the state has broadband.

[2] http://www.akamai.com/stateoftheinternet/ (accessed September 16, 2013). Akamai's ratings reflect data measured at the edge of all the networks and these averages can fluctuate quarterly when a new report is issued. The rates are also indicative of the competition among states to utilize new network infrastructure and enhanced speed offerings.

currently being left behind technologically because they cannot afford the cost of a computer or the cost of obtaining internet access.

The schedule for completion of this regional broadband plan is outlined in the following planning schedule.

Planning Schedule

- Complete a comprehensive review and endorsement of the preliminary draft of the Regional Broadband Plan at the February 20, 2014 BSG Meeting.

- Make revisions to the preliminary draft as requested by the BSG and schedule the plan for review and endorsement at the March 6, 2014, Executive Committee of the Southern New Hampshire Planning Commission [Endorsed by Executive Committee on March 6, 2014].

- Submit the adopted plan to the Southwest Region Planning Commission and the NH Office of Energy and Planning (NH OEP) by the end of March 2014 to be used in beginning to develop the statewide composite broadband planning document. This composite broadband planning document will incorporate the regional broadband plans currently being prepared by all nine regional planning commissions within the state.

- Schedule the plan for a 30-day public review and comment period during March 2014.

- Record all public comments and schedule the plan for public hearing and adoption at the March 25, 2014 Southern NH Planning Commission meeting [No public comments received].

- Integrate all final comments into the plan and distribute the adopted plan to the Southwest Regional Planning Commission, BSG members, key stakeholders and all municipalities in the region by the end of June 2014.

- Schedule a final BSG meeting to be held before June 2014 and one last public workshop on the plan before September 30, 2014.

Figure 1: September 27, 2012 Broadband Public Forum

- Between June and December 2014, provide assistance to UNH, NH OEP, and the Southwest Region Planning Commission in integrating the Regional Plan into the final statewide composite broadband planning document.

Source: SNHPC

B. Introduction*[3]

1. 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.

Figure 2: National Broadband Map Zoomed in on the North East

Source: National Broadband Map, http://www.broadbandmap.gov/technology
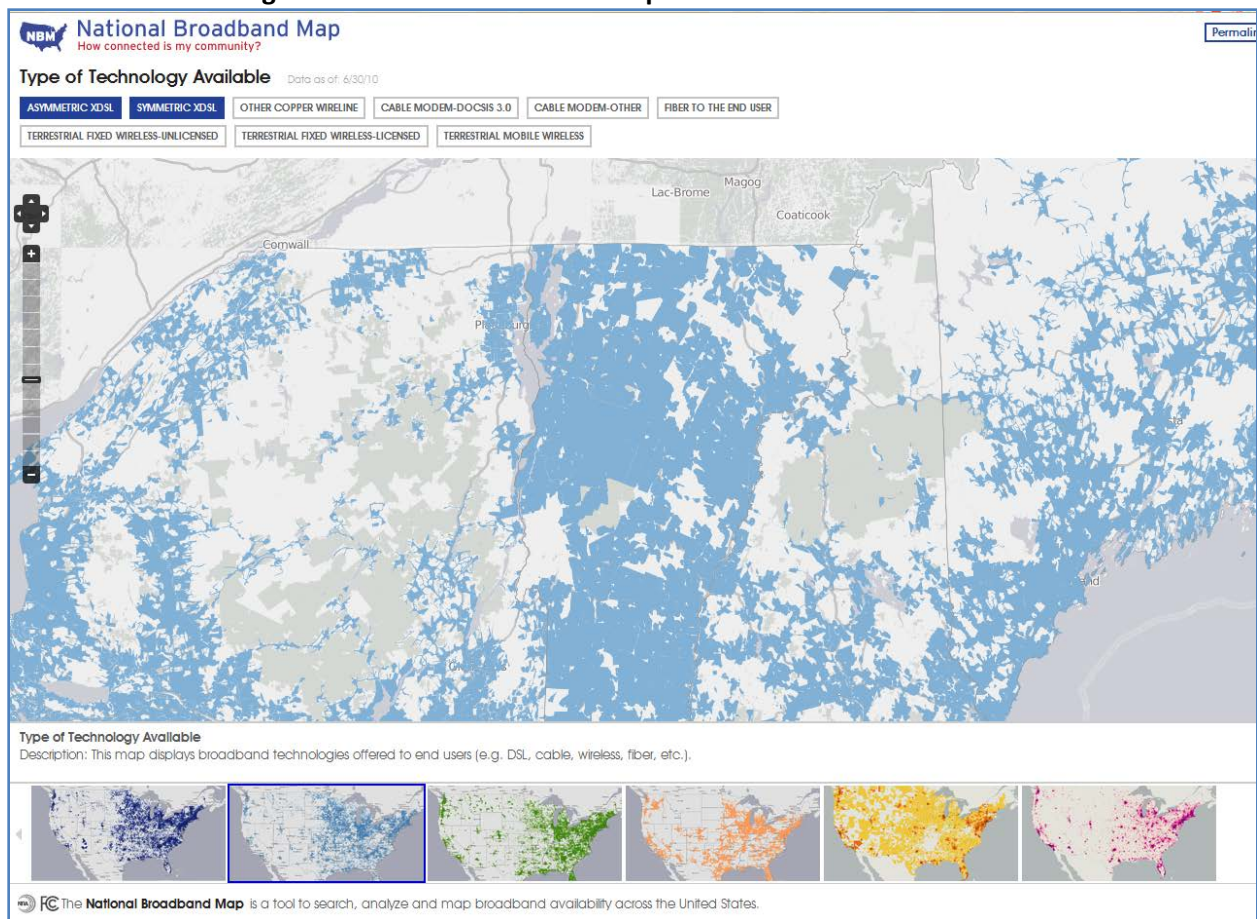
The NHBMPP is managed by the GRANIT (Geographically Referenced Analysis and Information Transfer) System within the Earth Systems Research Center at the University of New Hampshire (UNH), and is a collaboration of multiple partners. These partners include: the NH Office of Energy and Planning (OEP),

---

[3] Content for this section (pages 3-7) was provided by the Southwest Regional Planning Commission.

NH Department of Resources and Economic Development (DRED), UNH Cooperative Extension (UNHCE), UNH Information Technology (UNHIT), and the state's nine regional planning commissions (RPCs).

2. Purpose and Objectives

The NHBMPP is comprised of several components, including a broadband availability inventory and mapping effort and a series of planning initiatives, such as technical assistance and training, and capacity building. The following provides a brief description of each of these components.

Mapping

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

- 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;

- Refining the information collected on broadband availability by initiating a series of verification efforts, including map verification with community collaborators, online speed tests and user surveys, a statewide cell phone reception study, and other related activities;

- Surveying and mapping broadband availability at local community anchor institutions (CAIs), such as schools, libraries, hospitals, public safety facilities, and municipal buildings;

- Developing the first public master address file of households located in rural census blocks;

- Collecting and hosting an inventory of all cable franchise agreements in the state; and,

- Sharing information and data on broadband availability 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

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

- Assessing the broadband training and technical needs of stakeholder groups, including educational institutions, small business, municipalities, healthcare providers and organizations to determine topics stakeholders would like to receive training on and applications that would be of use to stakeholders;

- Developing tools and learning modules on topics related to broadband utilization and adoption, such as "Leveraging Broadband to Promote Economic Development", "Putting your Business on the Digital Map", and "Three Free Ways to Promote Your City/Town/School via the Web"; and,

- Delivering workshops, training and technical assistance to broadband stakeholder groups to support increased broadband adoption and use.

Capacity Building

Capacity building is the third component of the NHBMPP, which is focused on the development of tools and resources necessary to implement broadband projects within communities and regions across the state. The Director of Broadband Technology, who works for DRED, and project staff from UNHCE and UNHIT, are working together to enhance broadband capacity by:

- 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 at the state and federal levels;

- 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;

- Researching successful community broadband solutions and funding options and aggregating these success stories into a toolkit on broadband solutions and funding for NH; and,

- Establishing a Resource Team, who will work with RPCs and broadband stakeholder groups (BSGs) to identify communities prepared to initiate their broadband plans and provide assistance with community broadband decision making.

3. Overview of Planning Process

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

As part of an effort to gain a better understanding of broadband at the regional level, each RPC developed a broadband stakeholder group, comprised of individuals representing a wide range of sectors, which met quarterly. The BSGs have played a vital role in assisting RPCs in assessing the need for improved broadband capability, availability, and affordability. The BSGs helped the RPCs develop a list of broadband needs and barriers to broadband adoption and utilization. They also assisted with developing key goals and key action steps to overcome barriers in each region.

Figure 3: BSG Activities

BSG

Determine and prioritize need for Broadband services in the Southern New Hampshire Region

Identify and propose solutions to barriers for Broadband deployment in the Southern New Hampshire Region

Foster collaboration among government officials, business leaders, institutions and Internet Service Providers

Consider Broadband as part of the region's basic infrastructure needs

Source: UNH

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

Additionally, each RPC held three public forums throughout the course of the project. These forums were an opportunity to share information regarding ongoing broadband efforts in the region, the progress of the NHBMPP, 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 identify ways to increase broadband adoption and utilization. The regional broadband plans serve as guidance documents for communities, policy makers, businesses, institutions, state agencies, and residents to better understand the availability and need for and utility of broadband now and into the future. Upon completion OEP will compile all nine regional plans into a composite statewide broadband planning document.

C. Understanding Broadband*4

1. What is Broadband?

Broadband, also called 'high-speed internet,' is the umbrella term referring to internet access that is always on and is 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."[5] 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

---

[4] Content for this section (pages 8-16) was provided by the Understanding Broadband Subcommittee.

[5] "Broadband: As defined by the NH Broadband Mapping and Planning Program," *New Hampshire Broadband Mapping and Planning Program*, February 15, 2012, http://iwantbroadbandnh.com/planning-and-assistance. (accessed July 17, 2013).

and consultation can occur.[6] 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 developed a matrix to assist stakeholders in understanding the many levels of broadband available in the state of New Hampshire today, as well as 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 three 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.

Figure 4: Tiers of Broadband Service

Tiers of Service	Download Speed	Upload Speed	Typical Functions / Use (functions additive to level above)
un-served	< 768 Kbps	< 200 Kbps	• Email (client/server-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

---

[6] *"*Broadband: As defined by the NH Broadband Mapping and Planning Program," *New Hampshire Broadband Mapping and Planning Program*, February 15, 2012, http://iwantbroadbandnh.com/planning-and-assistance. (accessed July 17, 2013).

Establishing a broadband connection requires investment in a physical network that facilitates the transfer of information. Broadband infrastructure consists of an 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, 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.[7]

Figure 5: Broadband Network Connections

Source: http://www.whitehouse.gov/sites/default/files/20091217-recovery-act-investments-broadband.pdf
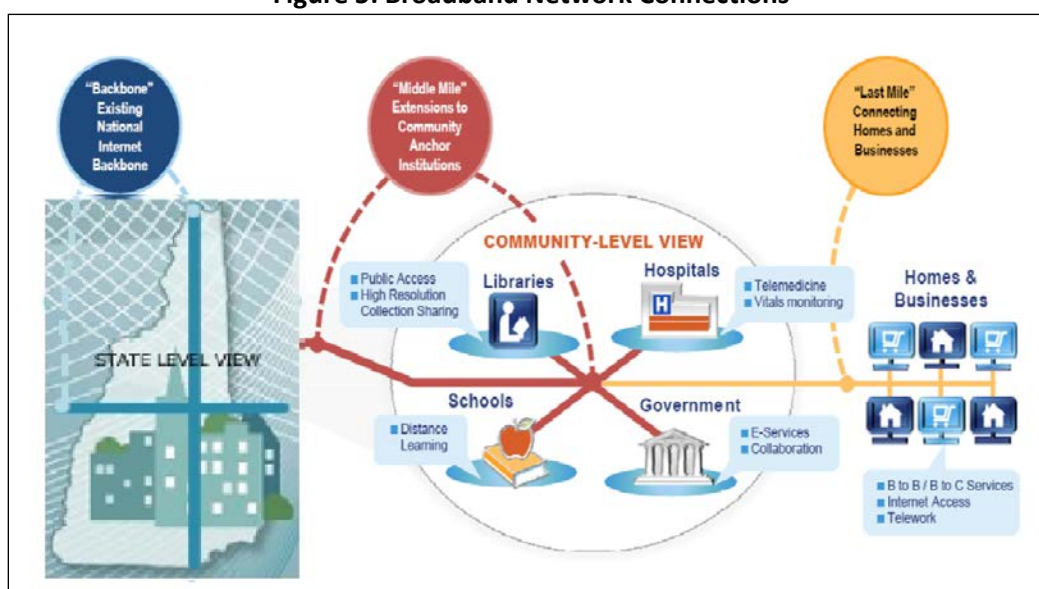
There are many different broadband delivery technologies. These technologies can be separated into two major categories of wired and wireless broadband. Wired technologies include Digital Subscriber Lines (DSL), Cable Modem, Fiber Optics, Leased Lines (T1), and Broadband over Powerline (BPL). Wireless technologies include mobile wireless (3G, 4G, LTE, WiMax), Wi-Fi, satellite, and Wireless Internet Service Providers (WISP).[8] 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.

---

[7] State of New Hampshire, Department of Resources and Economic Development and The Telecommunications Advisory Board, State of New Hampshire Broadband Action Plan: Appendix A, 2008, http://www.nheconomy.com/uploads/Broadband-Action-Plan-Appendices.pdf . (accessed July 17, 2013).

[8] "Wireless Internet 101," *Institute for Local Self-Reliance*, http://www.ilsr.org/content-types/fact-sheets-resource-archive/?contenttype=fact-sheets-resource-archive&initiative=broadband. (accessed June 2013).

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.[9] The most common DSL connections are asymmetric, with networks offering more bandwidth and faster speeds for download compared to upload, since residential users predominately are downloading more information from the internet than uploading. Symmetric types of DSL provide equal bandwidth for uploading and downloading speeds, which is sometimes marketed as "Business DSL" as companies often have greater needs for uploading, or transmitting data.

Cable Modem, which is typically faster than a common asymmetric DSL connection, uses the cable network to deliver broadband to users. Cable networks are a shared connection, so speeds can slow during peak usage times due to congestion when people in the same neighborhood are online. Fiber optic systems use lasers across very thin strands of glass creating reliable, resilient technology that has an extremely high capacity for speeds and data transmission. There is a high cost associated with laying out the fiber network but once in place, the system can be easily upgraded and maintained, with lower operating costs than DSL, cable, or wireless networks.[10] 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, cell phones, etc.).

Wireless Internet Service Providers are designed to cover large areas using point-to-multipoint networks to broadcast wireless data up to 20 miles. A signal is broadcast from a base station and is received by a fixed wireless antenna mounted on a customer's premises. A combination of a Wi-Fi Hotspot and a WISP can enable a Neighborhood Internet Service Provider (NISP) or a Wi-Fi Hotzone. A Wi-Fi Hotzone can cover a set geographic area such as a neighborhood, shopping mall, or campground.[11] WISP networks can provide "last mile" solutions and broadband availability to rural areas where it is often cost-prohibitive to build wired networks.

---

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

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 upload speeds are typically slower than wired or other wireless networks.[12] 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.[13]

2. Why is Broadband Important?

Broadband in 2014 is 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 impacting the ability of communities to achieve economic growth and maintain a certain quality of life. In a relatively short period of time, fast and reliable broadband has become essential for economic and community development and it is critical infrastructure for public safety, education, health care, business and government operations.[14]

Communities today face many challenges: a competitive global marketplace; an aging population; the need for a better-educated and better-prepared workforce; and, access to health care. These issues are magnified in rural areas, as the distance between households and services makes it difficult to access certain resources and opportunities. Reliable and cost-effective broadband can help community leaders find innovative solutions to these challenges.

Figure 6: Projected Broadband Speed in North America
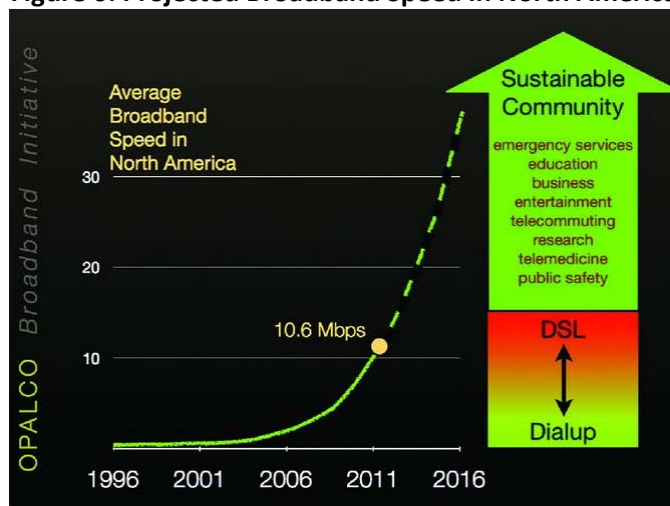
Source: http://www.opalco.com/broadband/do-we-really-need-faster-internet-service-2013-05-01/

---

[12] Shuffstall, Bill, Monica Babine, and Andy Lewis, "Connecting Communities," *The National e-Commerce Extension Initiative*, http://www.connectingcommunities.info/. (accessed July 2013).

[13] "Wireless Internet 101," *Institute for Local Self-Reliance*, http://www.ilsr.org/content-types/fact-sheets-resource-archive/?contenttype=fact-sheets-resource-archive&initiative=broadband. (accessed June 2013).

[14] "Building Community Capacity through Broadband (BCCB) Initiative," *University of Wisconsin Extension*, November 2010, http://www.uwex.edu/broadband/documents/BCCBUWEXFAQ_rev_11_18_10withmap.pdf. (accessed June 2013).

There is no doubt that we live in an information society, and broadband connects us to opportunities and services. Whether this is training for a new skill, a new language, or completing an online course, broadband facilitates the access of information in many different forms.[15] In 2010, it was estimated that there were almost 200 million Americans with access to broadband at home, up from 8 million in 2000.[16] 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.

Importance of Broadband by Sector

Education

Broadband is an important tool that enhances access to and improves the quality of education at all levels, in New Hampshire and across the country. Broadband-enabled teaching and learning has the potential to extend learning beyond the limits of the classroom, provide more customized learning opportunities, and increase the efficiency of school systems.[17] 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.[18] 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.[19] 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.

---

[15] David Salway, "Why is Increasing Broadband Adoption so Important to Society?," *About.com Guide*, http://broadband.about.com/od/barrierstoadoption/a/Why-Is-Increasing-Broadband-Adoption-So-Important-To-Society.htm. (accessed July 2013).

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

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

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

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

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.[20] 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.[21] 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 Care

With increasing and changing health needs, ranging from rising health care 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 how these issues are addressed. Many emerging technologies and approaches to health care are dependent on broadband connections to improve health care outcomes, while also controlling costs and extending the reach of health care providers.[22] Individual patients, providers, and the overall public health of a community benefit from more efficient, innovative, and informed health care systems as new technologies are adopted.

Telehealth, the broader term incorporating telemedicine, is the transfer of electronic medical data (images, sounds, live video and patient records) from one location to another. It includes the use of electronic information and telecommunications technologies to support long distance clinical care, patient and professional health-related education, public health, and health administration.[23] New Hampshire, with a rural geography, scarcity of local specialty medical services, and a high percentage of elderly residents, can benefit from telehealth systems.[24] Broadband internet is necessary to continue supporting current and emerging telehealth applications for patients, providers, hospitals, and health care businesses.

Electronic medical records systems enable providers to collaborate on patient care by accessing treatment information from different locations. Patients can have better access to their medical records and information in an effort to better engage them and their families in managing their health. Video conferencing allows physicians to conduct video consultation and monitor treatment of patients remotely. It also increases the reach of specialized physicians and research.[25] 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.

---

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

[21] Charles M. Davidson and Michael J. Santorelli, *The Impact of Broadband on Education*, A Report to the U.S. Chamber of Commerce, Dec. 2010, http://www.uschamber.com/sites/default/files/about/US_Chamber_Paper_on_Broadband_and_Education.pdf. (accessed July 2013).

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

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

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

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

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. Demands for services are constantly increasing, yet organizational budgets rarely follow that same trend. 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 but technology can augment New Hampshire's tradition of accessibility to the public process. Citizens have come to ask for, and sometimes expect, a certain level of online interactivity with government and community support organizations. Most towns in New Hampshire currently host websites, which provide 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 and E-governance 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 great distances.

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 as a result of expanded broadband.[26] Broadband and economic development are connected in that 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

---

[26] R. Crandall and H. Singer. "The Economic Impact of Broadband Investment." *National Cable and Telecommunications Association*, 2010.

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 percent between 2008 and 2018 or at a rate of 2.5 percent faster than the average for other occupations and industries.[27] 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 percent of New Hampshire households and businesses had access to broadband and, nationally in 2012, 66 percent of adults have broadband at home, which is up from 3 percent in 2000.[28] 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.[29]

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 percent of businesses surveyed boosted the speed of their access to knowledge, 54 percent saw reduced communications costs and 52 percent saw increased marketing effectiveness.[30] 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.

---

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

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

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

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

D. Regional Broadband Overview

1. Introduction

The Southern New Hampshire Planning Commission (SNHPC) Region consists of 14 municipalities located within south-central New Hampshire, not far from the Massachusetts border. These municipalities include the towns of Auburn, Bedford, Candia, Chester, Derry, Deerfield, Goffstown, Hooksett, Londonderry, New Boston, Raymond, Weare, Windham and the City of Manchester, the largest city in the state (See Figure 7). The SNHPC Region includes portions of Hillsborough, Rockingham and Merrimack counties.

Figure 7: Southern New Hampshire Planning Commission Region
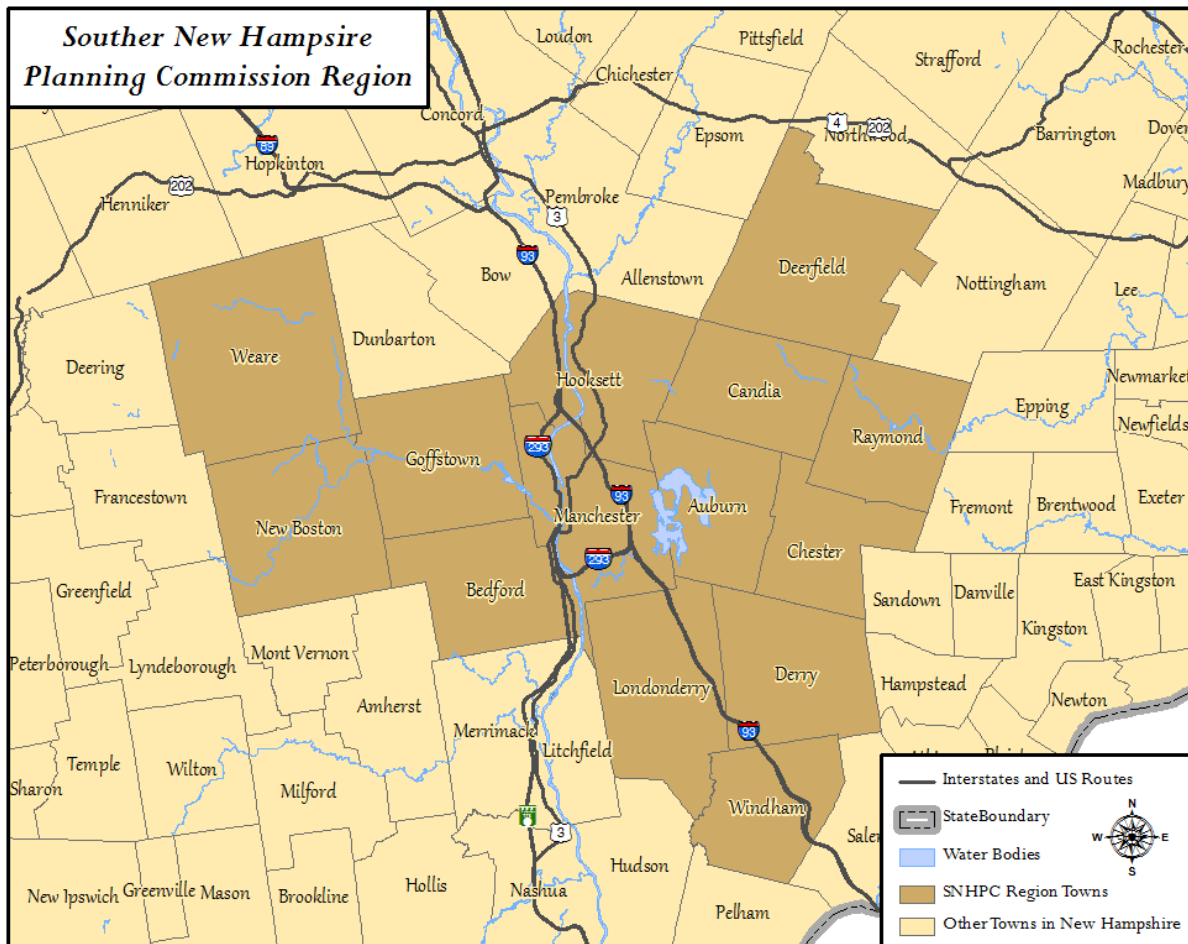
Source: SNHPC

Broadband infrastructure and services are currently available throughout the region. The level of service for broadband-intensive applications and uses varies however, from one part of the region to the other. Specifically, the Town of Deerfield is currently identified as "underserved" for high speed internet services based upon much of the data collected and mapped for this plan (See Figure 17 through Figure 26). Also there are identified isolated areas and stranded neighborhoods within most every town/city in the region that still lack high speed broadband access. These areas either lack access to broadband due to (1) geography or (2) technological limitations which are often related to the "last mile" or the physical distance between the area and the closest available broadband service or infrastructure. During 2013 and 2014, the SNHPC and all nine regional planning commissions across the state have been working together on a rural addressing project to verify these locations within each town/city in their region.

While the results of the broadband mapping work show that much of the SNHPC Region is served by a variety of internet service providers and technologies (e.g. cable, terrestrial fixed and mobile wireless, T-1, including optical carrier/fiber to the end user -- which is primarily available to customers in the Town of Weare and certain areas in the Town of Chester), there are still many residents and businesses within the Region that currently do not have broadband services such as DSL and high speed internet connections and thus lack equal access to opportunities for enrichment, education, or the global market place. Additionally, the cost of high speed internet services within the SNHPC Region is often beyond the economic reach of many marginalized and underrepresented populations, veterans, elderly and senior citizens, disabled, refugees, and lower income families and households. Many local businesses and town governments within the region are also in need of greater broadband speeds and connectivity, including system resiliency and backup power in case of emergencies, power outages and natural disasters.

To address these identified issues and problems and to seek solutions for expanding broadband infrastructure and service within the region; all fourteen municipalities have appointed representatives to serve on the region's Broadband Stakeholder Group (BSG) – an advisory committee charged with assisting and guiding the development of this plan. The BSG is the first time municipalities, businesses and residents have been asked to conduct broadband planning cooperatively at a regional scale. In developing this plan, the BSG has been meeting since the beginning of the project in 2012 and 2013 to identify the region's key broadband issues and needs and to develop a vision statement, key goals, objectives and recommendations for use in this plan.

i. Regional Broadband Vision

Central to this plan and the work of the BSG is the following broadband vision statement which was adopted by members of the Broadband Stakeholders Group (BSG) on May 16, 2013. This broadband vision is a guiding statement meant to achieve a future desired state for the SNHPC Region.

The vision prepared for this plan identifies and suggests that (1) the SNHPC Region be marketed as a "technology friendly" region both inside and outside New Hampshire; and (2) the SNHPC Region work together to promote the need for enhanced broadband infrastructure and access among all sectors and communities of the region – urban, suburban and rural. Additionally the vision statement recognizes there is a need to work together to bring about affordable broadband services to all sectors of society, as well as expanded broadband infrastructure, bandwidth and speeds to benefit and support enhanced economic development opportunities in the region.

In addition to this vision statement and central to this plan are specific key goals and objectives which are designed to enhance broadband use, affordability and connectivity as well as expanding the region's broadband infrastructure. These key goals and objectives represent the principal strategies and recommendations of this plan. As such, each key goal and objective has been reviewed and endorsed by the BSG and has been prioritized according to the following general topic areas within the Implementation section of this plan:

- Expanding Access to Affordable Broadband Service
- Broadband Use
- Cable Franchise Agreements
- Broadband Communications and Stakeholders Groups
- Resource Clearinghouse
- Municipal Broadband Master Plan Chapters
- Funding
- Fiber to the Home
- Continued Mapping and Data Collection Efforts
- Regulatory Barriers
- Resiliency of Broadband Infrastructure
- Broadband as Critical Infrastructure
- State Broadband Authority

Figure 8: SNHPC Broadband Internet Vision Statement

> ## *Vision Statement*
>
> *We envision that our communities, public institutions, businesses and Chambers of Commerce will consider and promote the Southern NH Region and the Greater Manchester area as a technology-friendly region. We believe that because of emerging technology, dynamic business needs, and changing market conditions, greater broadband services and connectivity will continue to grow and expand throughout the SNHPC Region. Currently, the SNHPC Region is diverse with areas of marginalized populations concentrated in certain communities that do not have or cannot afford broadband service to more affluent urban, suburban, and rural communities where broadband services and infrastructure are more readily available and accessible. However, regardless of the community, there are underserved areas within the region including specific neighborhoods that are in need of broadband service. It is our hope that this broadband plan will encourage all our communities, public institutions, businesses and Chambers of Commerce to work together to (1) bring about more affordable and accessible broadband services to the region; (2) expand broadband infrastructure and services to underserved areas; and (3) promote greater broadband connectivity and speeds to benefit and support enhanced economic development opportunities.*

ii. Key Goals and Actions

In developing the broadband vision statement for this plan, the BSG has supported the following key goals and actions for improving broadband infrastructure and service within the SNHPC Region.

Key Goals

a. Increase bandwidth and internet speeds among all service providers within the region.

b. Update zoning ordinances and land use regulations as necessary to require installation of conduit for future broadband installation as part of new construction.

c. Adopt and implement right-of-way regulations and policies for open trenching (such as shadow duct regulations) by all municipalities to control and provide for efficient broadband and cable installations.

d. Continue growth and expansion of free Wi-Fi services at existing and new cafes, restaurants, parks and other highly visible Wi-Fi hot spots through local planning policies and regulations to help retain and attract young professionals to the region.

e. Include chapters or sections dedicated to broadband planning in all municipal Master Plans.

f. Encourage local government to consider, plan, implement and enhance broadband connectivity among all local public facilities and public institutions, including schools.

g. Encourage municipalities and counties to consider, plan, seek funding and install publicly-owned broadband networks for government, education, health and public safety purposes.

h. Offer affordable, need-based high speed internet services and speeds to lower income neighborhoods, households and marginalized citizens (such as refugees, senior citizens, handicapped individuals, veterans, students, etc.).

i. Reduce carbon footprint by service providers offering enhanced internet services and speeds to qualified home-based businesses and residents who telecommute or work directly out of their homes.

j. Encourage the installation of the highest available broadband technology (i.e. such as fiber optics) to every end user – home or business within the region by the year 2030. This has already been achieved in the Town of Weare and portions of the Town of Chester.

k. Encourage the installation of backup power sources or generators to ensure continuous and reliable power as well as broadband and internet access during emergencies and natural disasters by all municipalities and businesses.

l. Empower all neighborhoods, residents and businesses within the region to establish and obtain broadband service where there is none available within their community or neighborhood.

m. Encourage the region's municipalities to work together to (1) share in the cost of legal services in negotiating and updating new cable franchise agreements, and (2) participate in cooperative purchasing agreements to address local needs for broadband services and equipment.

n. Continue to encourage and expand educational opportunities in every community in the region to obtain increased broadband and internet capabilities and services.

Key Actions

a. Work with all service providers within the region to develop and execute plans to achieve the goal of providing greater bandwidth and faster broadband speeds. Download speeds in the region should exceed 1 Gbps.

b. Work with municipal planners to review and update local site plan regulations and land use policies as necessary to require the installation of conduit for fiber optics in new construction.

c. Work with municipalities to consider adopting and implementing licensing fees for private utility installations, including shadow duct regulations for the purpose of not only providing for efficient utility installations, but also as a local source of funding for broadband infrastructure and development.

d. Contact all service providers including high visibility electronic/technology companies to develop partnerships and secure funding to develop a free Wi-Fi program (especially in low-income neighborhoods) within the City of Manchester and surrounding towns.

e. Provide every community in the region with a toolkit that could be used in developing a local broadband plan (or a chapter in the municipal master plan) identifying how to achieve broadband connectivity among local schools, libraries, public safety, municipal buildings, community facilities and other key anchor or public institutions within the community (See Figure 23).

f. Encourage all service providers to offer affordable internet services to low-income households, refugees, senior citizens, handicapped individuals, veterans, students - similar to Comcast's *Internet Essentials* program (see: http://www.internetessentials.com/how-it-works).

g. Encourage all service providers to develop and offer affordable internet services with tiered pricing options to home-based businesses, residents who telecommute, and businesses that allow telecommuting to expand the region's economic growth and development.

h. Encourage all service providers to develop and implement plans for installing the highest available broadband technology (such as fiber optics) to every home/business in the region by the year 2030.

i. Research grants and other funding opportunities to help assist municipal governments in developing and implementing back-up power supply systems and local generators so they can obtain continuous power and reliable broadband and internet connectivity during power outages, storms and other natural disasters.

j. Develop and provide a handbook or guide for communities -- neighborhoods, residents and businesses to be able to work with providers, local and state government in seeking funding and developing local plans for broadband infrastructure expansion and connectivity, especially for "end of the line" areas.

k. Work with all municipalities to update and renew local cable franchise agreements, particularly by considering inclusion of technology grants above the cable franchise fees that can be used by the municipality to help fund local broadband and information technology services and needs. See Town of Auburn's cable franchise agreement technology grant as an example.

l. Encourage Manchester Community College, chambers of commerce and all local business incubators to offer and/or expand internet training for marginalized populations, homeowner and business use and applications.

iii. History of Local Broadband Master Planning Efforts

In July 2013, SNHPC conducted a review of the current master plans for all 14 municipalities within the SNHPC Region to determine if the plans included information and/or a section on the availability of broadband and internet services, community needs and future plans. This review revealed there has been little, if any, local effort(s) in broadband planning, development and implementation among the region's municipalities and counties. One of the primary reasons for the lack of broadband inclusion in master plans is that only a handful of staff, resources and Information Technology (IT)

"Telecommuting is a reality for a number of residents, as are home-based businesses. These trends are expected to continue."

(2005 Windham Master Plan, p.88)

departments work day-to-day in both maintaining and planning local broadband infrastructure, services and connectivity among departments and municipal facilities and buildings. The Town of Deerfield's Master Plan is currently the only master plan in the region which includes a specific chapter dedicated to broadband and internet services. This master plan chapter was developed by SNHPC, in coordination with the Deerfield Planning Board, during February and March 2012.

In summary, Table 1 indicates at least seven of the region's 14 municipal master plans contain a reference or some references to local broadband needs, plans and recommendations. Many of the master plans containing these references were developed after 2007, which indicates that broadband is evolving and increasing in importance.

Table 1: Broadband Inclusion in Master Plans

Municipality	Broadband Reference?	Year Master Plan was Adopted
Auburn	Yes	2007
Bedford	Yes	2010
Candia	*No*	*2004*
Chester	*No*	*2006*
Deerfield	*No*	*2008*
Derry	*No*	*2010*
Goffstown	Yes	2006
Hooksett	*No*	*2004*
Londonderry	Yes	2013
Manchester	Yes	2009
New Boston	*No*	*2006*
Raymond	Yes	2009
Weare	*No*	*2005*
Windham	Yes	2005
Regional Rate	**50%**	**-**

Source: SNHPC

Examples of some of the broadband references in community master plans include:

- The Town of Raymond's 2009 Master Plan emphasizes the economic importance of expanding broadband service to the rural areas of the community.[31]

- The Town of Bedford's 2010 Master Plan recommends that the Town of Bedford "Encourage, support and facilitate robust systems for high-speed data and wireless communication, and 'work-from-home' policies," with an identified timeline of 3-5 years.[32]

- The City of Manchester's 2009 Master Plan recognizes the vulnerability of their telecommunication and information systems. The plan cites that a backup and redundancy of connections is critical for the reliable operation of their municipal government.[33]

- Echoing this concern, the Town of Londonderry's 2013 Master Plan also acknowledges that storms are increasing in frequency and severity, causing disruptions to vital utilities. Londonderry's Master Plan "advocates for the burial of overhead utilities in new development to minimize risk for outages in the community." The document continues by also suggesting that

---

[31] 2009 Raymond Master Plan, p. 184.
[32] 2010 Bedford Master Plan, p. 8-6.
[33] 2009 Manchester Master Plan, p. 18.

municipal officials coordinate with local utility providers to identify opportunities to bury existing utility lines.[34]

- The towns of Goffstown and Auburn only briefly mention broadband in their master plans.

In summary, it is clear that except for the City of Manchester and the towns of Bedford, Londonderry and Raymond, many of the smaller rural communities within the SNHPC Region are lacking either the capacity or focus to address broadband as an important planning, infrastructure and economic development consideration in their community. As noted in the regional vision statement as well as in the key goals and objectives of this plan, encouraging all communities to expand broadband infrastructure and services is vital to the goal of expanding network connectivity and working together to create a technology-friendly region. This regional broadband plan provides a significant amount of information that municipalities can use to help prepare their broadband master plan chapter. Some of this information includes the statewide and local broadband mapping products; statewide broadband infrastructure projects currently under construction through Network NH Now, including the 750 mile fiber-optics network operated by NHOS; the fiber to the premises network operated by NH FastRoads; and the more robust public safety microwave network (See Sections C. and D., as well as the following Figure 9 showing the Regional BTOP Improvements located in the Greater Manchester region).

Figure 9: Regional BTOP Investments
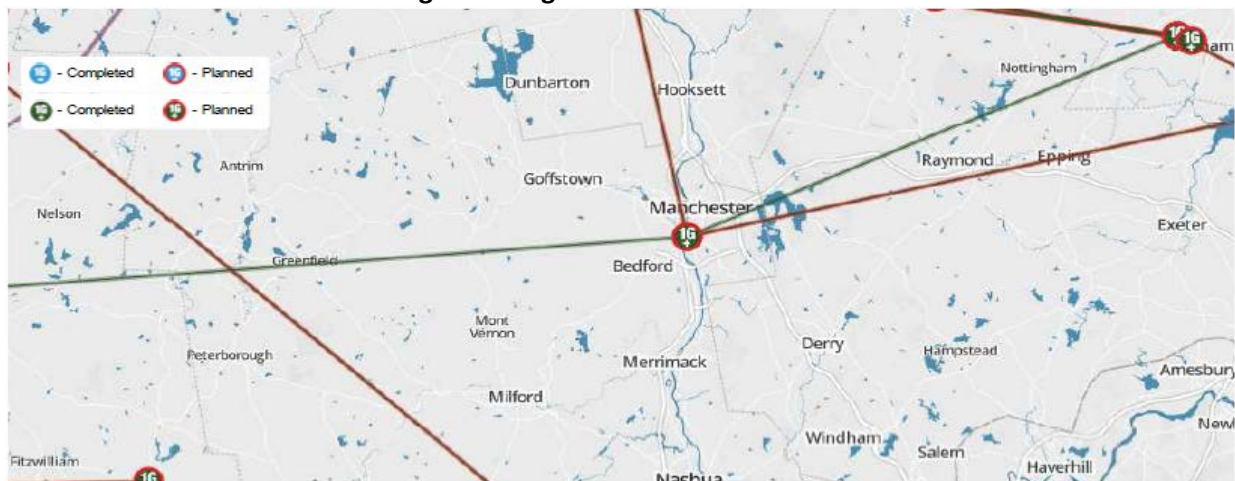
Source: Broadband Technology Opportunities Program[35]

---

[34] 2013 Londonderry Master Plan, p.200.
[35] (http://www2.ntia.doc.gov/BTOPmap/) accessed August 13, 2013.

2. Regional Overview

i. The Region's Geography and Physical Landscape

The SNHPC Region is located mainly in the Merrimack River Valley area of New Hampshire. The Merrimack River flows north to south through the direct center of the region. The river provides both a natural geographic and political boundary between Hillsborough and Merrimack Counties to the north and west, and Rockingham County to the east.

The Merrimack River is also the largest single river basin in the state. The topography of the region is shaped by the river and the lakes, foothills, ridges and mountains forming to the east and west of the region (See Figure 11: Regional Steep Slopes). The western communities of the region feature the Uncanoonuc Mountains primarily in Goffstown along with additional hills in New Boston and Weare. The central and southeastern portions of the region have relatively less topography due to close proximity of local bodies of water, such as Lake Massabesic, Canobie Lake and the Merrimack River.

Cumulatively, the SNHPC Region consists of a total of 519.31 square miles.[36] The predominant land uses are residential and commercial.

Like much of New Hampshire, the SNHPC Region enjoys four seasons and has a temperate climate similar to most of southern New England. While the majority of the region's terrain does not pose a significant barrier in developing broadband infrastructure, much of the region's smaller hills, ridges and mountains and to some degree the smaller rural and less dense population centers present some physical and economic limitations for broadband services and infrastructure. In addition, there are many long dead end and unpaved roads and rural areas throughout the region, which are underserved or have not been directly served by broadband.

Figure 10: SNHPC Region At-A-Glance

Population:	**274,854**
Land Area:	**519.3 square miles**
Developed Land:	**141,300 acres**
Undeveloped Land:	**173,861 acres**
Median Age:	**40.5**

Race/Ethnicity:
91.88% White
2.05% African-American
0.23% American Indian
2.40% Asian
4.42% Latino
1.53% Some Other Race
1.86% Two or More Races

Educational Attainment:
93.6% High School Graduates
35.3% Bachelor's Degree or Higher

Median Household Income:	**$88,030**
Percent Unemployed:	**5.2%**
Number of Businesses:	**6,959**
Number of Jobs:	**119,405**

Percent Below Poverty Line:
2.6% All Families
4.0% All People

Source: 2010 U.S. Census

---

[36] NH GRANITE, "Land Area Figures for New Hampshire Cities and Towns"
(http://www.nh.gov/oep/programs/DataCenter/library.htm#geography)

Figure 11: Regional Steep Slopes

ii. Socio-Economic Characteristics

a) Population

The SNHPC Region is currently home to roughly 274,854 people, 6,959 private businesses, and 119,405 private and public sector jobs.[37] The majority of these people, a total of 109,565 residents and 3,201 businesses, are located within the City of Manchester, the most populous municipality and center of employment in both the SNHPC Region and the state.[38]

In addition to Manchester, the SNHPC Region contains seven suburban communities, with substantial downtowns and/or commercial/industrial centers ranging in size from 10,138 to 33,109 residents (see Table 2). These suburban communities include the towns of Bedford, Derry, Goffstown, Hooksett, Londonderry, Raymond and Windham. Four of the communities – Derry, Londonderry, Bedford, Goffstown and Windham are also respectively the 4th, 10th, 13th, 14th, and 20th most populous municipalities in New Hampshire. In addition to these larger municipalities, the SNHPC Region contains six smaller rural or bedroom communities ranging in size from 3,909 to 8,785 residents. These smaller rural communities include the towns of Auburn, Candia, Chester, Deerfield, New Boston and Weare (See Figure 12 and Figure 13).

Table 2: Municipal Populations

Municipality	2000	2010	Numeric Change	Percent Change
Auburn	4,682	4,953	271	6%
Bedford	18,274	21,203	2,929	16%
Candia	3,911	3,909	-2	0%
Chester	3,792	4,768	976	26%
Deerfield	3,678	4,280	602	16%
Derry	34,021	33,109	-912	-3%
Goffstown	16,929	17,651	722	4%
Hooksett	11,721	13,451	1,730	15%
Londonderry	23,236	24,129	893	4%
Manchester	107,006	109,565	2,559	2%
New Boston	4,138	5,321	1,183	29%
Raymond	9,674	10,138	464	5%
Weare	7,776	8,785	1,009	13%
Windham	10,709	13,592	2,883	27%
Regional Total	**259,547**	**274,854**	**15,307**	**6%**

Source: U.S. Census Bureau

---

[37] NH Employment Security, Economic and Labor Market Information Bureau, 2011 Annual Averages
[38] ibid.

Figure 12: Population by Municipality
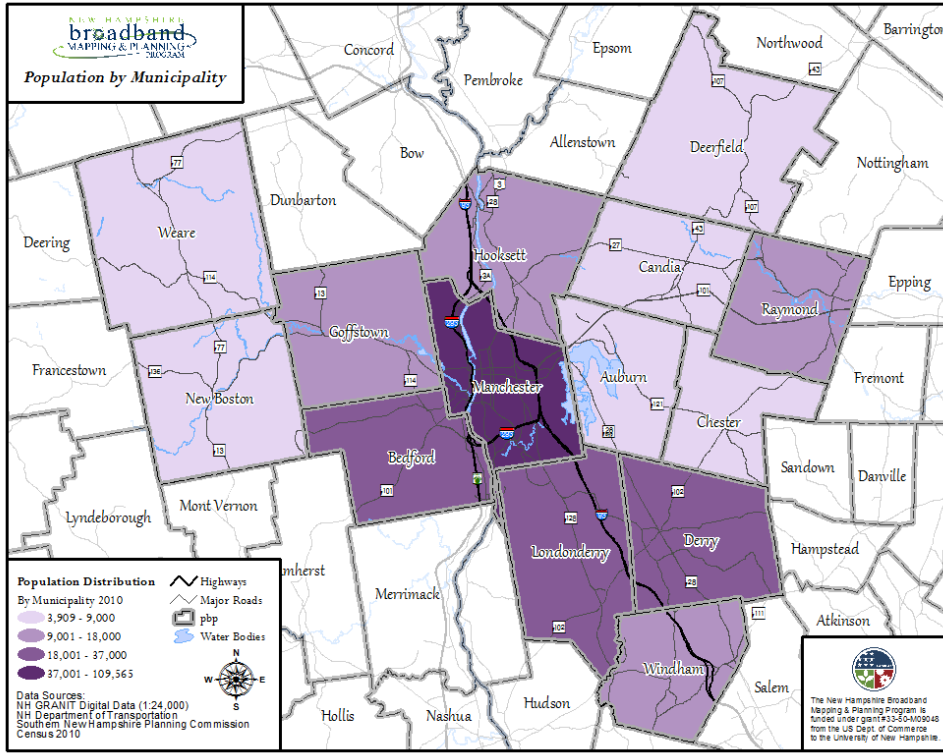
Source: SNHPC

Figure 13: Population Change, 2000-2010

Source: SNHPC

28
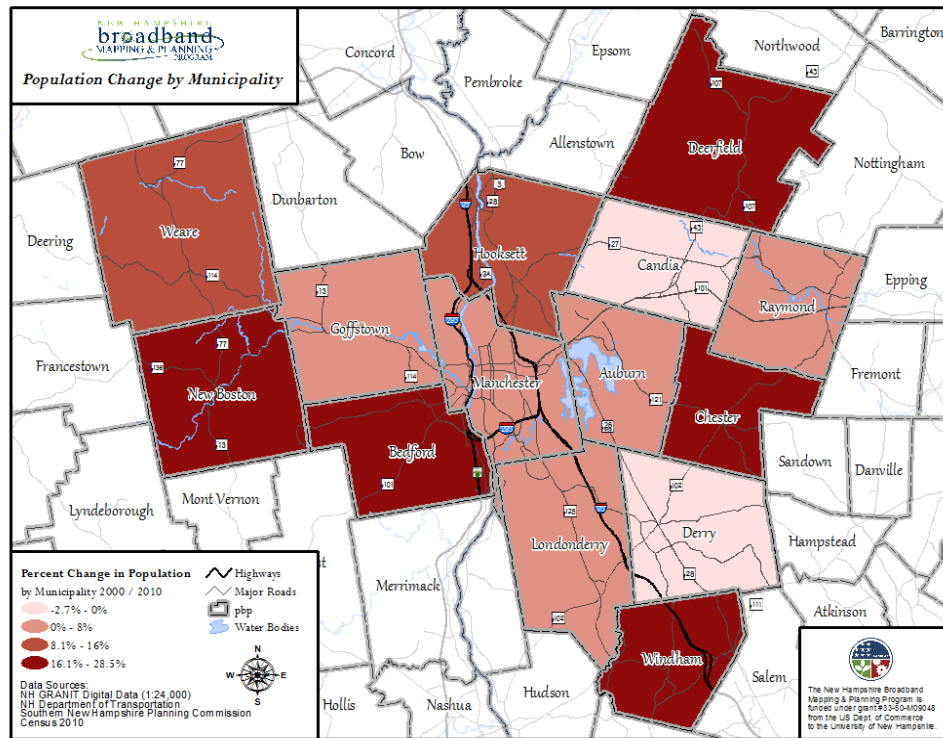
b) Population Growth

The U.S. Census figures released in December 2010 show that the 2000s saw the slowest rate of population growth in New Hampshire in six decades (New Hampshire Center for Public Policy Studies). As shown in Figure 14, New Hampshire's past population growth rates were well over 20 percent between 1970 and 1990. Between 1990 and 2000, the growth rate slipped to 11.4 percent and between 2000 and 2010, it was only 6.9 percent. Much of this decline can be attributed to economic conditions as well as slowing in-migration rates as population growth is measured by both births and deaths, as well as in- and out-migration. Currently, New Hampshire's in-migration rates are very low.

Figure 14: Percent Change in NH Population, 1950-2010
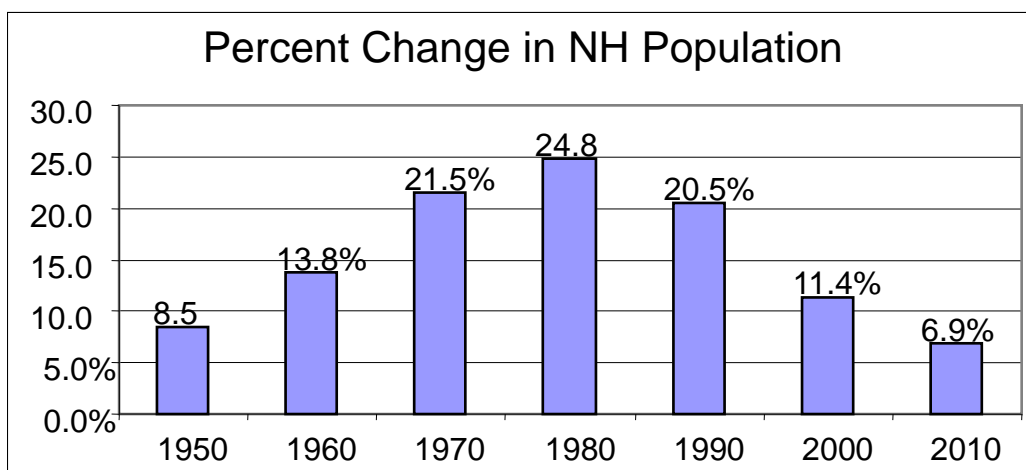
Source: New Hampshire Center for Public Policy Studies

Despite these declining growth rates, the total population of the SNHPC Region is continuing to grow and is projected to continue to increase in the future. Table 3 displays the most recent historic data as well as the projected population growth of the 14 SNHPC communities to the year 2040. An important outcome of the region's growth is that the relative need and market demand for high speed broadband and internet services will continue to remain strong within the SNHPC Region now and in the future.

Much of the SNHPC Region's future population growth is projected to occur through in-migration, as a result of the ongoing widening of I-93 from two to three lanes in both directions between the Massachusetts state line and Manchester. By improving the capacity and safety of this interstate highway, it has been determined by the New Hampshire Department of Transportation (NH DOT) and the Office of Energy and Planning (OEP) that it will be much easier for commuters and interstate commerce to travel between the two states, thus encouraging more people and more businesses to move or relocate to New Hampshire – particularly, Southern New Hampshire.

In addition, it is anticipated that the SNHPC Region will likely experience continued growth in the number of refugee and foreign-born populations resettling, migrating or relocating to the region, primarily to Manchester and other cities, such as Nashua and Concord. The City of Manchester has long been designated by the State Department as a resettlement center and there are currently more than 60 languages spoken in the school system. While the Mayor of Manchester has requested a reduction in

new refugee resettlement to the city, with continued geopolitical unrest and other worldwide events and disasters, it is likely that Manchester and the SNHPC Region will continue to experience increasing in-migration and resettlement of new refugees and foreign-born immigrants.

The International Institute of New Hampshire and the Holy Cross Family Learning Center, both located in Manchester, work together to resettle these marginalized populations, including offering English, computer classes and other business skills and services. Yet despite these efforts many refugees continue to struggle economically, even years after relocation, and often cannot afford to purchase a computer or pay for internet services. Foreign-born residents currently account for 11.8 percent of the Manchester's population and 18.9 percent of the total population of Manchester speak a language other than English at home.[39] As a result, education initiatives in Manchester are currently targeting these demographic groups to decrease the digital divide.

Table 3: SNHPC Population Projections

Municipality	2000	2010	2015	2020	2025	2030	2035	2040	Projected Population Change (2000-2040)
Auburn	4,682	4,953	5,137	5,288	5,519	5,712	5,983	6,226	33%
Bedford	18,274	21,203	22,242	23,243	24,121	24,816	25,409	25,886	42%
Candia	3,911	3,909	4,191	4,420	4,601	4,726	4,810	4,855	24%
Chester	3,792	4,768	5,097	5,404	5,711	5,982	6,239	6,437	70%
Deerfield	3,678	4,280	4,571	4,839	5,114	5,344	5,561	5,740	56%
Derry	34,021	33,109	33,881	34,400	34,931	35,195	35,416	35,215	4%
Goffstown	16,929	17,651	18,171	18,663	19,162	19,583	19,942	20,142	19%
Hooksett	11,721	13,451	14,159	14,809	15,431	15,961	16,432	16,790	43%
Londonderry	23,236	24,129	25,132	26,082	27,267	28,438	29,925	31,477	35%
Manchester	107,006	109,565	112,395	114,895	117,555	119,351	120,724	121,235	13%
New Boston	4,138	5,321	5,582	5,796	6,120	6,403	6,795	7,201	74%
Raymond	9,674	10,138	10,593	11,424	11,918	12,261	12,705	13,000	34%
Weare	7,776	8,785	9,497	10,183	10,857	11,464	12,013	12,472	60%
Windham	10,709	13,592	14,502	15,320	16,239	17,061	17,774	18,375	72%
Regional Total	**259,547**	**274,854**	**285,151**	**294,765**	**304,548**	**312,296**	**319,725**	**325,049**	**25%**

Source: SNHPC

As shown in Table 3, the greatest percentage of population growth within the SNHPC Region by 2040 will likely occur in the towns of New Boston (74 percent) and Chester (70 percent); while the greatest numeric population increases are projected to occur in Manchester and the towns of Londonderry, Derry, Hooksett and Bedford in that order. The projected distribution of population change by 2040 among the 14 municipalities is displayed in Figure 15.

---

[39] 2007-2011 American Community Survey 5-Year Estimates.

Figure 15: Projected Population Change (2000-2040)
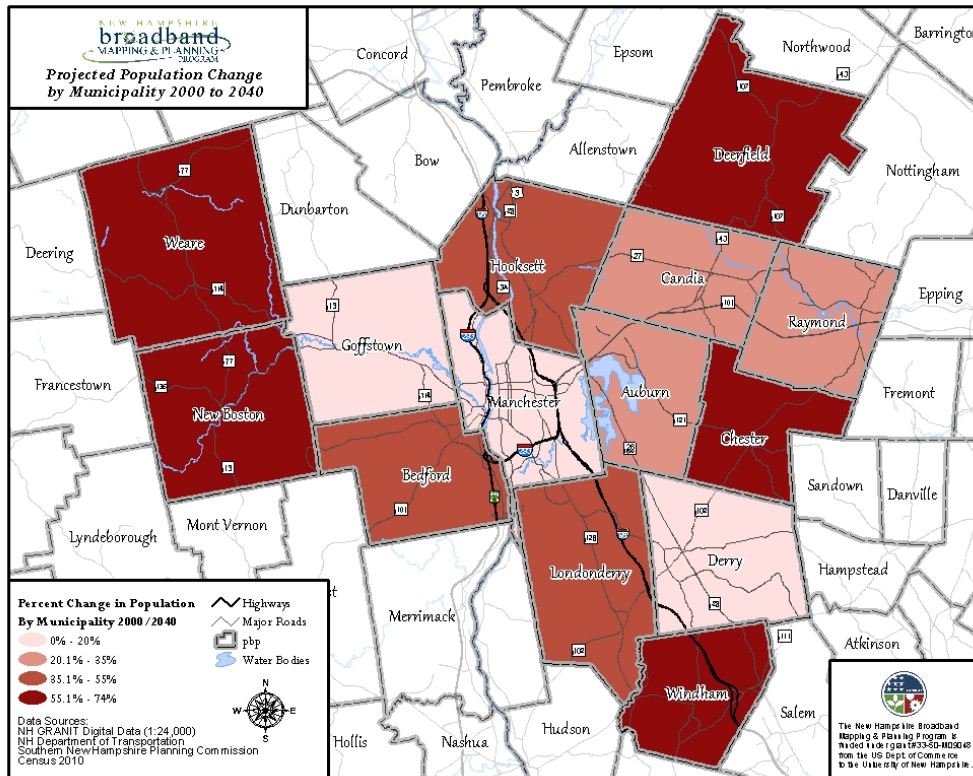
Source: SNHPC

c) Median Age

Another important socio-demographic trend confronting the SNHPC Region and New Hampshire is the overall aging of the population. Specifically, both New Hampshire and the SNHPC Region's population is growing older and the median age of the population is increasing. At the same time, the total number of children (0-18) and young adults (30-39) residing in New Hampshire and the SNHPC Region is declining.

Table 4 provides a comparison between the median age of each SNHPC community, New Hampshire and the United States as a whole. It reveals that the towns of Bedford, Auburn and Candia have the oldest median age (42, 43 and 44) while the towns of Goffstown, Derry and Manchester have the youngest median age (39, 38 and 36). The City of Manchester's younger median age of 36 reflects in large part the considerable student population living and attending college within the city as well as the current socio-cultural trend for many of the younger generation graduating from college to locate in cities.

The implications of an aging population for broadband and internet applications is not well known, particularly when this aging occurs in place. However, it can be anticipated that an aging population may not have a significant impact on future internet use as many residents who are not yet senior citizens living and working within the SNHPC are already closely attached to broadband infrastructure and the internet in their daily and professional lives.

Table 4: Median Age

Municipality	Median Age		Percent Change
	2000	*2010*	
Auburn	36.8	43.5	18%
Bedford	39.2	42.3	8%
Candia	37.6	44.5	18%
Chester	35.7	40.6	14%
Deerfield	36.2	42.0	16%
Derry	33.6	38.2	14%
Goffstown	35.4	39.0	10%
Hooksett	35.3	39.8	13%
Londonderry	35.0	40.5	16%
Manchester	34.9	36.0	3%
New Boston	36.2	39.9	10%
Raymond	34.4	39.9	16%
Weare	34.1	39.1	15%
Windham	37.8	41.8	11%
Regional Average	**35.9**	**40.5**	**13%**
New Hampshire	37.1	41.1	11%
United States	35.2	37.2	6%

Source: U.S. Census Bureau

d) Young Adults

Another important demographic trend is that the number of young adults residing and working in New Hampshire and the SNHPC Region aged 25-34 and 35-44 has been decreasing since 2000. This overall decline in young adults is raising concerns about the long-term sustainability of the state's labor force as well as this generation's future needs in the way of broadband infrastructure and internet services. Generally the population age cohort 30 to 40 years old in 2009 belong to the group referred to as "Generation X."

Today, "Generation X" is smaller in size than both the Baby Boom generation ahead of them, and the "Generation Y" or the Millennials following them. What this new demographic data means is that with fewer adults 25 to 44 years old, there likely will be fewer children in New Hampshire and the SNHPC Region in the near future – in fact, there were 10,500 less students in the state's K-12 pipeline in 2008 than in 2000.[40]

At the same time, New Hampshire is now (as of 2009) the 4th oldest state in the nation. Maine, Vermont, and West Virginia are the 1st, 2nd, and 3rd oldest states, respectively. The implications of these demographic shifts mean that greater efforts are needed to improve both the state's educational system and job opportunities in order to retain and attract more young adults to replenish the state's workforce as the Baby Boom generation retires.

---

[40] New Hampshire Economic and Labor Market Information Bureau

At the SNHPC's 2010 annual meeting, the President and CEO of the New Hampshire College and University Council reported that New Hampshire currently has one of the highest percentages of student populations leaving the state (48 percent) to pursue higher education. The overall New England average is only 39 percent. In addition, many graduates of New Hampshire's colleges and universities are leaving the state after graduation. Effective strategies are needed to retain the state's college graduates and maintain the state's status as an attractive place for businesses requiring highly skilled professionals to locate.

The 55 Percent Initiative, a collaborative effort launched in 2007 to encourage more New Hampshire college students to live and work in the state after they graduate has been one of the more visible strategies addressing these demographic concerns. However, as recently reported by the New Hampshire Employment Security, Economic and Labor Market Information Bureau (ELMB), the current state of the economy – both nationally, as well as for New Hampshire – has changed considerably since the 55% Initiative was launched in 2007. Specifically, as a result of the recession many workers close to retirement in the state have seen their retirement funds dwindle, so their decision to retire any time soon is generally being postponed. Additionally, some retirees may have decided to re-join the labor force as a result of the current economic climate.

In the past, out-migration of younger adults did not significantly impact the state's economy, as experienced workers with high educational attainment tended to migrate into the state from more densely populated areas. Now that population growth and in-migration has slowed, New Hampshire has to rely more heavily on those graduating from educational institutions in the state to become the educated workforce of the future. This makes the 55% Initiative that much more of an economic development imperative. A continuation of young adult out-migration in New Hampshire will hinder attempts of cultivating a technology-savvy and competitive workforce.

e) Housing

The City of Manchester and the Town of Derry currently contain the largest number of housing units of all the municipalities located within the SNHPC Region. At the lower end of the scale, the towns of Chester, Candia, Deerfield, New Boston and Auburn all contain the fewest number of housing units in the region (see Table 3).

Typically population density and the number of housing units or households within a community are good indicators of market demand for broadband services. Larger communities with higher population densities and large numbers of housing units generally contain the greatest number of internet service providers, including more choices in internet services, service options and programs. Smaller communities with scattered population centers and fewer housing units typically have fewer broadband choices as there may be only one or two internet service providers within the community given the lack of competition.

Table 5: Municipal Housing Units

Municipality	2000	2010	Numeric Change	Percent Change
Auburn	1,622	1,814	192	12%
Bedford	6,401	7,634	1,233	19%
Candia	1,384	1,494	110	8%
Chester	1,247	1,596	349	28%
Deerfield	1,406	1,743	337	24%
Derry	12,735	13,277	542	4%
Goffstown	5,798	6,341	543	9%
Hooksett	4,307	5,184	877	20%
Londonderry	7,718	8,771	1,053	14%
Manchester	45,892	49,288	3,396	7%
New Boston	1,462	1,967	505	35%
Raymond	3,710	4,254	544	15%
Weare	2,828	3,466	638	23%
Windham	3,906	5,164	1,258	32%
Regional Total	**100,416**	**111,993**	**11,577**	**12%**

Source: U.S. Census Bureau

f) Economy

Despite recent positive economic indicators that the economy is showing signs of improvement, such as gains in jobs growth and a decline in the number of new claims for unemployment, a full recovery from the 2008 national recession has not yet occurred. In fact, the current economic downturn caused by the collapse of many financial institutions, which is officially indexed to have started in the month of December 2007, may be one of the worst economic recessions in our nation's history since the Great Depression. Many economic forecasts indicate New Hampshire, like the nation, will face a long and slow recovery.

Major impacts of the national recession on New Hampshire, the SNHPC Region, and its municipalities have included: slowing population growth rates; higher reported unemployment and unemployment claims; record high numbers of foreclosures; depressed economic activity and growth; increased personal bankruptcies, business closings and layoffs; lower wage and salary increases; higher poverty rates and issuance of food stamps; higher health insurance costs; sharp drop in new housing starts, building permits, and construction employment; weak real estate demand and credit markets; retreating housing and property values; increasing vacancy rates; weak consumer spending; and declining revenues, resulting in larger state and municipal budget deficits. Overall, there has not been one sector of the economy, either private or public, which has not been impacted in some way by these current economic conditions.

Yet, according to many economic indicators, both the state of New Hampshire and the SNHPC Region are performing better than national averages in numerous areas. In fact, New Hampshire was identified as the second-fastest growing job market in the country, according to information released by the U.S.

Department of Labor in 2010.[41] The 2012 SNHPC Region's unemployment rate of 5.2 percent is well below the national average of 8.7 percent. [42] [43]

The available workforce in the SNHPC Region is diverse and ranges from unskilled, minimum wage workers to highly trained workers in specialized fields. This is an attractive mix that appeals to a variety of commercial and industrial businesses entering the region. Job growth is critical to sustaining and improving the region's quality of life.

Eight of the SNHPC Region's 14 municipalities have recently appeared in a listing of the state's top 50 employment centers. Manchester ranked first in the state along with the towns of Bedford, Londonderry, Derry, Hooksett, Windham, Goffstown and Raymond at 6, 9, 14, 20, 23, 31, and 48, respectively.[44] The I-93 corridor between Manchester and Boston continues to be a major transportation corridor for economic growth within the region as it traverses the majority of these eight communities.

Table 6 breaks down employment in the SNHPC Region by industry sector. Of the three major industry sectors (Goods-Producing Industries, Services-Producing Industries, and Government), Services-Producing Industries has by far the largest number of employees and represents the main economic engine in the region. Sub-sector industries such as "retail trade" and "health care and social assistance" have the next largest proportion of employees. Many of these sub-sector industries depend heavily on broadband services, including:

- Information
- Finance and Insurance
- Real Estate and Rental and Leasing
- Professional and Technical Services
- Management of Companies/Enterprises
- Administration and Waste Services
- Educational Services
- Health Care and Social Assistance

Cumulatively, the sub-sector industries that rely on excellent broadband service account for 39 percent of all annual average employment in the region. Most importantly, the average weekly wage for these particular sub-sector industries is $1,091.97 and accounts for some of the highest paying weekly wages.

---

[41] US Department of Labor, Bureau of Labor Statistics: New Hampshire experienced job growth of 1.43 percent between June 2009 and June 2010, which resulted in 8,900 new non-farm related jobs. While New Hampshire is second, Massachusetts added more jobs, 16,700, but had the 12th fastest job growth in the country.
[42] N.H. Employment Security, Economic and Labor Market Information Bureau
[43] 2007-2011 American Community Survey 5-Year Estimates
[44] NH Employment Security, Economic and Labor Market Information Bureau, May 2012 (based on 2010 data)

Table 6: Employment and Wages by Sector

Industry	Regional Annual Average Employment	Proportion of Sector Employment	Regional Average Weekly Wage
Goods-Producing Industries	*17,333*	*14.52%*	*$1,097.86*
Agriculture/Forestry/Fishing	156	0.13%	$464.89
Mining	159	0.13%	$1,105.01
Construction	5,161	4.32%	$1,023.79
Manufacturing	11,858	9.93%	$1,138.30
Service-Providing Industries	*88,243*	*73.90%*	*$877.29*
Utilities	431	0.36%	$1,728.94
Wholesale Trade	5,626	4.71%	$1,232.90
Retail Trade	15,541	13.02%	$598.57
Transportation and Warehousing	4,057	3.40%	$820.05
Information	3,409	2.85%	$1,454.89
Finance and Insurance	5,188	4.34%	$1,471.58
Real Estate and Rental and Leasing	2,002	1.68%	$795.53
Professional and Technical Service	6,738	5.64%	$1,432.63
Management of Companies/Enterprises	2,424	2.03%	$1,224.87
Administrative and Waste Services	7,211	6.04%	$636.94
Educational Services	3,660	3.07%	$752.17
Health Care and Social Assistance	17,122	14.34%	$967.13
Arts, Entertainment, and Recreation	1,424	1.19%	$387.72
Accommodation and Food Services	8,893	7.45%	$317.19
Other Services Except Public Admin	4,514	3.78%	$667.75
Total Government	*13,829*	*11.58%*	*$956.32*
Total Regional Jobs	**119,405**	**-**	**-**

Source: NH Employment Security, Economic and Labor Market Information Bureau, 2011 Annual Averages

The NH Economic and Labor Market Bureau anticipates that by expanding broadband access and capacity, additional businesses within these targeted industries will likely grow or relocate to the SNHPC Region, thereby generating higher wage jobs. Generally, most all industry sectors today depend on broadband access for information and business purposes. Increased economic benefits could also be realized through free Wi-Fi access throughout the region.

g) Work At Home

High-speed internet has also sparked a revolution in telecommuting by allowing employees to access files and servers off-site to work. By increasing the popularity and rate of telecommuting, businesses and workplaces can help to decrease traffic congestion and greenhouse gas emissions and improve quality of life. Coordinated efforts such as this plan to increase broadband capacity and access can help in achieving these goals.

Table 7 displays the percent of the region's municipal workforce that works at home. Both the towns of Goffstown and Deerfield have rates above 11 percent; nearly double the region's overall average of 6 percent.[45] The Census Bureau term "work at home" does not distinguish between those who have a home-based business and those telecommuting; however, these numbers are the most accurate portrayal of workers telecommuting.

Table 7: Work at Home

Municipality	Percent Worked at Home	Percent Margin of Error
Auburn	4.4	+/-2.3
Bedford	6.2	+/-1.5
Candia	3.5	+/-2.0
Chester	**7.0**	+/-2.8
Deerfield	**11.0**	+/-7.5
Derry	3.6	+/-0.8
Goffstown	**11.1**	+/-3.5
Hooksett	5.0	+/-1.9
Londonderry	6.3	+/-1.5
Manchester	2.8	+/-0.4
New Boston	**8.3**	+/-3.5
Raymond	1.8	+/-1.1
Weare	4.9	+/-2.3
Windham	**8.2**	+/-2.3
Regional Average	**6.0**	**+/-2.4**

Source: 2007-2011 ACS 5-Year Estimates

---

[45] 2007-2011 American Community Survey 5-Year Estimates

h) Employment Projections

Future employment projections released by the New Hampshire Employment Security (NHES) indicate total employment within the SNHPC Region is expected to grow from 129,263 in 2010 to a total of 145,200 by the year 2020, a percentage increase of 12.3 (See Table 8: Projected Growth by Industry). These numbers were released in January 2013, prior to the Town of Windham joining the SNHPC Region, thereby slightly underestimating the projections. As noted earlier it is anticipated that continued population and employment growth, combined with the I-93 expansion, will have significant impacts on the economic conditions of the region in both the near- and long-term future.

Table 8: Projected Growth by Industry

Industry	Estimated 2010	Projected 2020	2010-2020 Change	
			Numeric	Percent
Goods-Producing Industries	*17,201*	*18,504*	*1,303*	*7.6%*
Agriculture, Forestry, Fishing and Hunting	507	528	21	4.1%
Mining	146	150	4	2.7%
Construction	4,819	6,092	1,273	**26.4%**
Manufacturing	11,729	**11,734**	5	0.0%
Service-Providing Industries	*102,441*	*116,416*	*13,975*	*13.6%*
Utilities	442	413	-29	-6.6%
Wholesale Trade	5,661	6,412	751	13.3%
Retail Trade	15,334	**16,747**	1,413	9.2%
Transportation and Warehousing	4,939	5,775	836	16.9%
Information	3,341	3,809	468	14.0%
Finance and Insurance	5,857	6,288	431	7.4%
Real Estate and Rental and Leasing	1,946	2,220	274	14.1%
Professional, Scientific, and Technical Services	6,633	**8,150**	1,517	**22.9%**
Management of Companies and Enterprises	2,204	2,325	121	5.5%
Administrative and Support and Waste Management Services	6,700	**7,966**	1,266	18.9%
Educational Services	10,390	**11,255**	865	8.3%
Health Care and Social Assistance	16,805	**21,023**	4,218	**25.1%**
Arts, Entertainment, and Recreation	1,383	1,597	214	15.5%
Accommodation and Food Services	8,935	**9,682**	747	8.4%
Other Services (Except Government)	5,230	5,769	539	10.3%
Government	*6,641*	***6,985***	*344*	*5.2%*
Self-employed and Unpaid Family Workers	*9,621*	*10,280*	*659*	*6.8%*
Total Regional Jobs*	**129,263**	**145,200**	**15,937**	**12.3%**

Source: NH Employment Security, Economic and Labor Market Information Bureau, January 2013

* Data released prior to Windham joining SNHPC

Nearly all new jobs in the region are expected to be concentrated in the service-providing industries, fueling the service sector economy of the region. Growth is spread throughout nearly all sub-sector industries, with notable gains in the "Transportation and Warehousing," "Information," "Real Estate," "Administrative" and "Arts and Entertainment" sub-sectors. Of significant interest is that the "Professional, Scientific and Technical Services" sub-sector is projected to surpass 20 percent growth and jobs in "Health Care and Social Assistance" and "Construction" are projected to surpass all industry sub-sectors, with 25.1 and 26.4 percent growth respectively (See Table 8: Projected Growth by Industry). These industry sectors also bode well for broadband expansion and growth.

Over the course of the next decade the "Health Care and Social Assistance" industry is expected to experience the largest growth as the state's population ages. The "Utilities" industry is the only sector projected to experience a decline. "Construction," which was hit hard during the 2008 economic recession, is projected to grow 26.4 percent by 2020 according to NHES. Goods-producing industries, government and self-employed sectors are projected to experience low growth.

i) Unemployment

As shown in Table 6, SNHPC Region's 2012 overall unemployment rate of 5.2 percent is better than New Hampshire's unemployment rate of 6.3 percent, and significantly less than the country's unemployment rate of 8.7 percent.[46] However, there are several municipalities, Manchester and Derry specifically, with relatively high unemployment rates within the region.

Table 9: Annual Average Unemployment Rate

Municipality	2007	2008	2009	2010	2011	2012
Auburn	2.8%	3.1%	5.5%	5.0%	4.6%	4.3%
Bedford	2.8%	2.9%	4.8%	4.6%	4.2%	4.4%
Candia	3.1%	3.1%	5.0%	5.3%	4.3%	4.7%
Chester	3.3%	3.3%	5.4%	5.7%	5.2%	5.1%
Deerfield	3.8%	3.5%	6.1%	5.9%	4.5%	5.5%
Derry	4.0%	4.4%	7.0%	7.0%	6.1%	**6.5%**
Goffstown	3.1%	3.2%	5.0%	5.3%	4.6%	4.6%
Hooksett	3.1%	3.5%	5.6%	5.6%	4.8%	4.9%
Londonderry	3.5%	3.7%	5.9%	5.9%	5.2%	5.6%
Manchester	3.9%	4.4%	7.2%	7.0%	5.8%	**6.1%**
New Boston	2.8%	3.0%	5.1%	5.1%	4.1%	4.9%
Raymond	4.1%	4.6%	7.5%	7.0%	5.9%	5.9%
Weare	3.1%	3.4%	5.6%	6.2%	5.3%	5.0%
Windham	3.7%	3.6%	6.1%	5.5%	5.1%	5.1%
Regional Average	**3.4%**	**3.6%**	**5.8%**	**5.8%**	**5.0%**	**5.2%**

Source: N.H. Employment Security, Economic and Labor Market Information Bureau

---

[46] 2007-2011 American Community Survey 5-Year Estimates.

j) Income

The SNHPC Region's average median household income is currently $88,030 (See Table 10). This is higher than that of both New Hampshire ($64,664) and the United States ($52,762).[47] The data reported in Table 10 includes the timespan just before and several years following the economic recession. There are several communities in the region which are identified as being financially resilient. These include the towns of Bedford, Chester and Windham; all three median household incomes surpass $100,000.

The City of Manchester's median household income is less than half that of Bedford's at $53,278. All of these figures, however, are above the national average. On a community basis, per capita income reveals less variability, with the exception of the Town of Bedford with more than $50,000.

Table 10: Median Household Income

Municipality	Median Household Income		Per Capita Income	
	Estimate	Margin of Error	Estimate	Margin of Error
Auburn	$92,938	+/-15,101	$34,811	+/-2,767
Bedford	$127,208	+/-10,236	$52,855	+/-3,179
Candia	$94,755	+/-8,403	$36,809	+/-2,614
Chester	$102,527	+/-10,094	$36,954	+/-3,392
Deerfield	$85,815	+/-9,566	$36,278	+/-4,393
Derry	$69,477	+/-5,126	$31,254	+/-1,307
Goffstown	$74,904	+/-6,531	$30,067	+/-1,900
Hooksett	$85,064	+/-4,044	$35,466	+/-3,450
Londonderry	$92,438	+/-6,800	$38,492	+/-2,128
Manchester	$53,278	+/-1,664	$27,467	+/-776
New Boston	$91,367	+/-11,761	$39,322	+/-3,904
Raymond	$66,438	+/-5,263	$28,531	+/-2,275
Weare	$78,810	+/-6,457	$31,731	+/-2,391
Windham	$117,402	+/-11,212	$48,336	+/-4,231
Regional Average	**$88,030**	**+/-8,018**	**$36,312**	**+/-2,765**

Source: 2007-2011 American Community Survey 5-Year Estimates

k) Poverty Rates

Correspondingly with these relatively high incomes, the State of New Hampshire currently has the lowest poverty rate in the nation, with only 8.0 percent of the population living below the poverty line, compared with 14.3 percent in the United States (See Table 11: Poverty Levels).

Many of the municipalities in the SNHPC Region have only a small percentage of families living at or below the poverty level, except for the City of Manchester. Manchester has the highest poverty rate in the region and within New Hampshire, with 13.8 percent of the city's residents living at or below the poverty line, but this rate is still slightly less than the national average.

---

[47] ibid.

Table 11: Poverty Levels

Municipality	Percent of All Individuals Below Poverty Level	Percent of Families Below Poverty Level
Auburn	1.7	1.8
Bedford	3.2	2.3
Candia	4.2	1.6
Chester	3.9	2.5
Deerfield	2.9	1.4
Derry	**6.3**	**4.5**
Goffstown	4.1	1.9
Hooksett	3.1	1.3
Londonderry	2.3	1.9
Manchester	**13.8**	**10.2**
New Boston	2.4	1.9
Raymond	**5.9**	**3.0**
Weare	1.5	1.0
Windham	1.2	0.5
Regional Average	**4.0**	**2.6**
New Hampshire	8.0	5.2
United States	14.3	10.5

Source: 2007-2011 American Community Survey 5-Year Estimates

Most of Manchester's low income households are concentrated in several census tracts located in or near the downtown (See Figure 16). There are also several low income census tracts existing within the towns of Derry and Raymond.

These low income census tracts also are home to many of the city's disadvantaged and marginalized populations, including the majority of immigrants and refugees who have been relocated to the city, unemployed veterans, the elderly, and many handicapped individuals and students. These are the populations who most often cannot afford the cost of purchasing a computer or paying for internet services. As a result, it is a key recommendation in this plan that these low-income areas have the highest priority for improvements in broadband penetration, affordability and use.

Figure 16: Low-Income Census Tracts
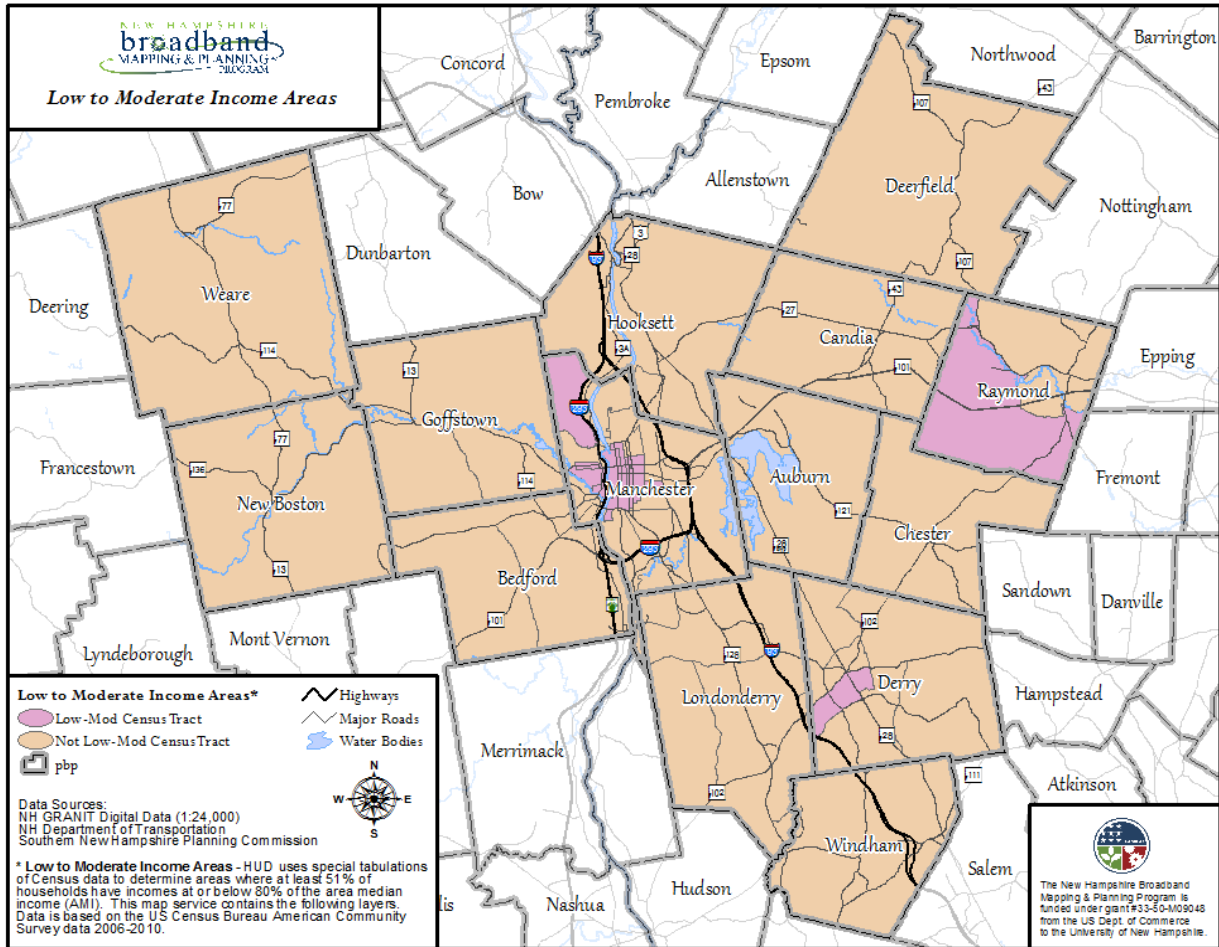
Source: SNHPC

l) Education

The SNHPC Region is also rich in higher education opportunities and home to many colleges, universities, and technical or vocational schools. These include University of New Hampshire – Manchester; Southern New Hampshire University (Manchester); Manchester Community College; Hesser College now known as Mount Washington College (Manchester); Saint Anselm College (Goffstown/Manchester); New Hampshire Institute of Art (Manchester); and the Massachusetts College of Pharmacy and Health (Manchester).

Table 12 illustrates educational attainment among residents within the SNHPC Region. As of 2009, New Hampshire ranks 9th nationally in the percent of population over 25 years old with a college degree.[48] Currently, 93.6 percent of the region's residents have earned a high school diploma and 35.3 percent have a bachelor's degree or higher. These percentages are above the 2009 national average of 85.3

---

[48] U.S. Census Bureau, "233 – Educational Attainment by State"
(http://www.census.gov/compendia/statab/cats/education/educational_attainment.html)

percent and 27.9 percent respectively (See Table 12).[49] A highly educated workforce increases the potential for higher-paying, specialized industries to develop and/or relocate to the area. As the largest region for higher education in New Hampshire (in terms of number of institutions and student population), access to high speed broadband and greater internet connectivity is a high priority.

Table 12: Educational Attainment

Municipality	Percent High School Graduate or Higher	Percent Bachelor's Degree or Higher
Auburn	94.0	33.6
Bedford	96.1	**58.1**
Candia	96.9	29.0
Chester	94.8	38.9
Deerfield	93.4	34.2
Derry	93.5	28.5
Goffstown	90.2	28.7
Hooksett	93.4	33.9
Londonderry	95.9	40.6
Manchester	86.1	25.8
New Boston	97.0	41.7
Raymond	88.2	22.0
Weare	94.6	26.0
Windham	96.3	**52.8**
Regional Average	93.6	35.3

Source: 2007-2011 American Community Survey 5-Year Estimates

The importance of broadband and internet services among public, private and charter schools is also another high priority. Educating children to be computer literate and knowledgeable of the educational resources on the internet will pave the path for the region's future generation to participate and contribute to the increasing information age we live in today.

m) Summary

With the widening of I-93 and natural population growth and in-migration, the SNHPC Region is expected to experience an increase of over 35,000 new residents between 2010 and 2030. This will present numerous challenges to the region, but also opportunities for economic growth, workforce development, and an improved standard of living. One of these opportunities will be improved regional mobility; an improved I-93 will make it easier for the region's residents to commute out of state for work. New business growth in the region will also be more compatible with the resident workforce growth. Continued attraction of high-skilled companies to the region is also highly important and anticipated. As part of one of the oldest states in the nation, the SNHPC Region and all of its

---

[49] ibid.

municipalities will need to develop and implement efforts to retain its young, well educated population in order to sustain its current economic success.

In short, the key to expanding and improving broadband access and connectivity in the region must come from local communities – the businesses, neighborhoods and residents which demand greater access and higher speeds. The SNHPC Region has many characteristics that encourage economic development, as well as positive indicators of economic growth for the future. The success of the region's economic future is dependent on stable, state of the art and equitable broadband access and service. The region's many desirable attributes, its skilled workforce, and improvements in broadband infrastructure, access, connectivity and resiliency will help to sustain this performance in the future.

3. Regional Broadband Availability

i. Results of Broadband Mapping

This section of the plan provides a summary of the results of the broadband mapping and data collection prepared for the SNHPC Region under the New Hampshire Broadband Mapping and Planning Program (NHBMPP). These maps provide information about existing broadband availability, technology, download speeds, and service levels among all fourteen (14) communities within the SNHPC Region. The maps are based upon the availability of the data submitted to the NHBMPP by existing service providers as of September 2013. For the purposes of this plan, a total of ten broadband maps have been produced for the SNHPC Region. These maps include the following:

- Broadband Technology with Maximum Advertised Download Speed
- Broadband Availability by Maximum Advertised Download Speed
- Level of Service for Broadband Intensive Applications and Uses
- Broadband Availability
- Broadband Availability for Uses that Require Moderate Speed
- Broadband Availability for Uses that Require High Speed
- Broadband Availability at Community Anchor Institutions
- Degree of Competition for Broadband Availability
- Satellite Broadband Service
- Wireline Versus Terrestrial Wireless Service Availability

Broadband Technology with Maximum Advertised Download Speed

Figure 17 shows that cable is currently the technology of choice in providing the highest maximum advertised internet services and download speeds within the majority of the communities in the SNHPC Region. This is true except for most of the Town of Weare and the far southeast corner of the Town of Chester where broadband has been made available directly through optical carrier/fiber to the end user. There are also numerous areas within several communities (such as the towns of Hooksett, Deerfield, Candia, Raymond, Auburn New Boston, Derry and Windham) where terrestrial fixed and mobile wireless provides the broadband technology with the highest maximum advertised download speeds.

Broadband Availability by Maximum Advertised Download Speed

Figure 18 shows that the Town of Weare and the far southeast corner of Chester where fiber is installed offers the highest advertised download speeds (>1 Gbps). At the other end of the scale, the Town of Deerfield, including several isolated areas within the towns of Hooksett, Candia and Auburn have the lowest advertised download speeds (3 Mbps to 6 Mbps). The majority of the SNHPC Region, however, currently has available broadband at maximum download speeds between 100 Mbps and 1 Gbps.

Level of Service for Broadband Intensive Applications and Uses

Figure 19 clearly identifies the Town of Deerfield as the only community in the SNHPC Region as underserved for broadband intensive applications and uses. There are also several isolated areas located within the towns of Derry, Windham and New Boston which are currently identified as served with reported gaps in service. There are no identified unserved or underserved areas with reported gaps within the SNHPC Region.

Broadband Availability

Figure 20 displays the availability of broadband based on internet service providers' advertised speeds. Again, this map identifies the Town of Deerfield as underserved. All other 13 communities within the SNHPC Region are served. To be considered served, broadband availability is considered to consist of a maximum advertised download speed of 3+ Mbps and a maximum advertised upload speed of 1.5+ Mbps.

Broadband Availability for Uses that Require Moderate Speed

Figure 21 explains that moderate speed is defined as advertised download speed 3 to 6 Mbps and advertised upload speed of 1.5 to 3 Mbps. Uses that require a minimum of moderate speed broadband include: medium to high social media use; sending and receiving medium to large-scale documents or files (photos, word processing); streaming standard-definition (SD) content; buffering not a concern; downloading high-definition (HD) content (movies, video) speed a concern); 3-5 connected internet devices possible; VPN access is needed, speed of operation is important but not critical to job function; multiple functions performing simultaneously required (e.g. web browsing, streaming video/music, downloading content), but not concerned with potential slowness of downloads; low quality, small window frame videoconferencing (Skype); and cloud-based computing and data storage. Almost the entire Town of Deerfield and many isolated areas in other towns throughout the SNHPC Region are shown not to have moderate broadband service available.

This map should be compared to Figure 20 to distinguish areas where service is not available from those that are unpopulated areas. In addition to the majority of Deerfield being underserved, the area does not have broadband available for uses that requires moderate speed.

Broadband Availability for Uses that Require High Speed

Figure 22 states that high speed is defined as advertised download speed greater than 10 Mbps and advertised upload speed greater than 6 Mbps. Uses that require a high speed broadband connection include: sending/receiving large files and small to medium sized databases; HD quality, codec based, large frame videoconferencing; multiple (bridged) sites/users; remote synchronous education, professional development, workshops, etc., facilitated simultaneously at multiple classrooms and/or other locations; telehealth/telemedicine applications; high speed end to end network and business to business applications; telemetry-based applications (rely critically on the ability of broadband to continuously monitor and multiplex data, i.e. remote patient monitoring, sensing systems, etc.); and "Internet2" connectivity and applications.

46

This map is, for all intents and purposes, identical to Figure 21. The majority of the region that is able to use applications that require moderate speed broadband is also the same that enjoys the ability to use applications that require high speed broadband. As stated in the description of Figure 21, this leaves the Town of Deerfield considerably disadvantaged, both technologically and economically, compared to its neighbors.

Broadband Availability at Community Anchor Institutions

Figure 23 identifies those community anchor institutions (e.g. K-12 schools; libraries; medical/health care; public safety; university/college; and other governmental and non-governmental community institutions) where broadband is currently available or not available or not known to be available. Broadband availability at these institutions is absolutely necessary, for educating students using the latest technology and at medical and public safety facilities in accessing high-speed broadband for important public safety reasons and emergencies. There are numerous schools, libraries, medical, public safety and other community institutions throughout the SNHPC Region where it is not known if broadband is available or not.

Most K-12 schools in the SNHPC Region are noted as having broadband available, although there are a few facilities in the towns of Raymond, Deerfield, Chester and Londonderry that do not or are not known to have broadband available. Of major concern is the fact that many medical/health care facilities report either not having or not known to have broadband access. The majority of these facilities are clustered in Manchester, with several other medical/health care facilities without broadband or unknown to have broadband service found in Bedford, Hooksett, Londonderry, Derry, Windham and Raymond. Public Safety facilities noted as unknown or not having broadband available are documented to exist in the towns of Weare, Deerfield and Bedford.

The data collected on community anchor institutions for this map was obtained by contacting each institution to establish their baseline broadband availability profile. This inventory is updated by the GRANIT System at University of New Hampshire and all the regional planning commissions in the state every six months utilizing the NHBMPP Community Anchor Institution web portal. All municipalities, public safety officials and health organizations, and facilities within the SNHPC Region are encouraged to inspect Figure 23 and to go to the NHBMPP Community Anchor Institution web portal (http://iwantbroadbandnh.org/get-involved) to identify/verify the Community Anchor Institutions designated as not having or unknown to be connected to broadband. Through the broadband mapping and data collection prepared for the SNHPC Region, it will be an important goal and action step of this plan to ensure the Town of Deerfield and all the isolated unserved areas as well as all the CAIs within the region be adequately identified and provided with the necessary infrastructure to obtain access and connectivity to reliable and high-speed broadband within the immediate future.

Degree of Competition For Broadband Availability

Figure 24 identifies the number of broadband providers offering internet services to residents and end users within all 14 communities in the SNHPC Region. Based upon this data, the majority of the SNHPC Region, particularly areas with the greatest population density in the communities surrounding

Manchester, have the greatest number of internet service providers (e.g. between 6 and 12). The towns with the least number of service providers include the towns of Deerfield, Weare, Raymond, Chester, Candia and New Boston (e.g. between 1 and 5). Please refer to v. Broadband Providers for an inventory of specific providers available by municipality.

Satellite Broadband Service

Figure 25 confirms that all 14 communities in the SNHPC Region have satellite broadband service available.

Wireless Versus Terrestrial Wireless Service Availability

Figure 26 confirms that all 14 communities within the SNHPC Region have both wireless and terrestrial wireless broadband service available.

ii. Depiction of served, underserved, and unserved areas

Based upon the broadband maps and data collected for the SNHPC Region, it is confirmed that for the purposes of this plan, 13 of the region's 14 municipalities are adequately served with broadband (See Figure 20: Broadband Availability). To be considered "served," users must have the ability to download at a speed of 3+ Mbps and upload to the internet at a speed of 1.5+ Mbps. Currently, Deerfield is the only municipality which is confirmed as "underserved" within the region.

With a population of approximately 4,280, Figure 19 clearly shows that the Town of Deerfield lacks adequate broadband service as compared to the rest of the region. Specifically the town lacks broadband services capable of providing intensive internet applications and uses which typically require a minimum of 6 Mbps downstream and 1.5 Mbps upstream to be fully functional.

In addition, despite fairly widespread broadband availability and adequate broadband speeds in the SNHPC Region as demonstrated by broadband maps produced for this plan, there are still many isolated and scattered "end of line" areas and neighborhoods that have been identified on these maps which lack adequate service and high broadband speeds.

iii. Delineation of modes

Figure 17: Broadband Technology with Maximum Advertised Download Speed is the best map displaying the maximum advertised download speed by available broadband technology, such as DSL, cable, fixed wireless, mobile wireless, fiber and other technologies available in the region. The data portrayed by this map closely matches the results contained in section i. Granite State Future Survey/Public Forum Results. As shown by this data, the vast majority of the SNHPC Region is covered by cable and this specific broadband technology currently offers customers fast (but not the fastest) download and upload speeds available.

Locations in the SNHPC Region where terrestrial mobile wireless and terrestrial fixed wireless services are most available generally correspond with rural and unpopulated areas.

In the SNHPC Region, optical fiber, the broadband technology capable of the fastest speeds, is currently only available in the Town of Weare, as well as the southeast corner of the Town of Chester. Granite State Telephone is currently the only Internet Service Provider (ISP) that has made a significant investment and commitment in installing fiber to residences and businesses within these communities. Ultimately, everyone within the SNHPC Region could benefit from improved broadband connectivity and improved service if other ISPs also provided and offered fiber to their customers. This is identified as an important and future long term goal of this plan.

As evident by Figure 25 and Figure 26, the SNHPC Region has universal broadband service availability through satellite, wireline and terrestrial wireless services. However, despite the availability of these modes of broadband, very few residents in the SNHPC Region responded in the recent GSF survey that they are actually utilizing these broadband services.

A significant area lacking both moderate and high speed broadband speeds is the proposed Pettengill Road industrial development area located south of the Manchester-Boston Regional Airport in the City of Manchester and the Town of Londonderry. The future growth and development of the Pettengill Road area is directly tied to the overall future economic growth of the region. As such, it is extremely important that adequate broadband infrastructure be provided to this area in the near future.

iv. Broadband Speed/Quality

As noted previously, Figure 21 and Figure 22 show where broadband is available at moderate and high speeds within the region. Residents' living in areas where broadband is capable of handling high speeds have access to download speeds greater than 10 Mbps and upload speeds greater than 6 Mbps. At these speeds, users are able to view high-definition videos, send and receive large file sizes, handle large databases and telemedicine applications. Many of the areas depicted with "no available service" are also unpopulated areas. While both Figure 21 and Figure 22 are nearly identical, these maps serve to emphasize the need for and lack of adequate broadband in the Town of Deerfield.

While the majority of the SNHPC Region has access to download speeds within the range of 100 Mbps and 1 Gbps (as advertised by providers shown on Figure 18), the maximum advertised download speed of 6 Mbps and 10 Mbps in Deerfield is in stark contrast to the rest of the region. Both Weare and Chester are fortunate to have maximum advertised download speeds exceeding 1 Gbps. Corresponding with Figure 17, "optical carrier/fiber to the end user" is the mode of broadband technology capable of delivering fast speeds.

v. Broadband Providers

There are, in general, a large number of broadband providers currently operating within the SNHPC Region. This is an indicator that there is healthy competition, which contributes to lower prices and potentially more coverage and higher speeds as providers try to attract customers with better services. As shown on Figure 24, many communities in the Southern New Hampshire Region have been found to have between eight to twelve broadband providers available for customers to choose from.

Communities along the fringes of the region, such as Weare, New Boston, Deerfield, Raymond, Chester and Candia generally have the least (two to seven) broadband providers. Many of the communities located immediately along and/or within the I-93 corridor are found to have the highest number of broadband providers. This corridor reflects where the majority of the region's population can be found.

The current list of available Internet Service Providers (ISPs) operating within the SNHPC Region as of September 2013 is provided in Table 13. This list often changes so it must be kept up to date locally for each municipality as ISPs change. It should be noted that each identified ISP offers internet services through a variety of different modes, such as with Satellite or Wireless. In summary, there are a total of 18 Internet Service Providers currently operating throughout the SNHPC Region.

The City of Manchester and the Town of Hooksett currently have the largest number of ISPs at 14 each. The towns of Bedford, Goffstown and Windham currently have 13 ISPs each. The towns with the fewest number of ISPs are the towns of Deerfield and Raymond with only 9 respectively.

AT&T, Comcast, FairPoint, G4 Communications, T-Mobile and Verizon Wireless are the only service providers which offer broadband services within all 14 municipalities in the region.

Clear, Clearwire, Level 3 Communications, TDS Telecom, MetroCast, OTT Communications and Dunbarton Telephone Company are the primary service providers which offer broadband in the fewest number of municipalities in the region.

Table 13: Internet Service Providers

Internet Service Providers[50]	Municipalities														Total Municipalities ISP serves in Region
	Auburn	Bedford	Candia	Chester	Deerfield	Derry	Goffstown	Hooksett	Londonderry	Manchester	New Boston	Raymond	Weare	Windham	
AT&T Mobility, LLC	X	X	X	X	X	X	X	X	X	X	X	X	X	X	**14**
Clear														X	**1**
Clearwire														X	**1**
Comcast	X	X	X	X	X	X	X	X	X	X	X	X	X	X	**14**
Dunbarton Telephone Company, Inc.		X					X	X		X	X		X		**6**
FairPoint Communications, Inc.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	**14**
G4 Communications	X	X	X	X	X	X	X	X	X	X	X	X	X	X	**14**
Granite State Telephone	X	X	X	X		X	X	X	X	X	X	X	X	X	**13**
Level 3 Communications, LLC										X					**1**
MegaPath Corporation	X	X	X	X		X	X	X	X	X	X			X	**11**
MetroCast			X		X			X				X			**4**
OTT Communications		X					X	X		X					**4**
Spectra Access	X	X		X		X	X	X	X	X	X		X	X	**11**
Sprint	X	X	X	X	X	X	X	X	X	X		X	X	X	**13**
T-Mobile	X	X	X	X	X	X	X	X	X	X	X	X	X	X	**14**
TDS Telecom											X		X		**2**
U.S. Cellular	X	X	X	X	X	X	X	X	X	X	X		X	X	**13**
Verizon Wireless	X	X	X	X	X	X	X	X	X	X	X	X	X	X	**14**
Total Providers	**11**	**13**	**11**	**11**	**9**	**11**	**13**	**14**	**11**	**14**	**12**	**9**	**12**	**13**	

Source: New Hampshire Broadband Mapping and Planning Program

[50] Providers listed are those that submitted data indicating they offer broadband services via the technologies displayed in the profiled community.

Figure 17: Broadband Technology with Maximum Advertised Download Speed

Figure 18: Broadband Availability by Maximum Advertised Download Speed

Figure 19: Level of Service for Broadband Intensive Applications and Uses

Figure 20: Broadband Availability

Figure 21: Broadband Availability for Uses that Require Moderate Speed

Figure 22: Broadband Availability for Uses that Require High Speed

Figure 23: Broadband Availability at Community Anchor Institutions

Figure 24: Degree of Competition for Broadband Availability

Figure 25: Satellite Broadband Service

Figure 26: Wireline Versus Terrestrial Wireless Service Availability

vi. Broadband Costs

As reported by the UNH Survey Center in conducting Granite State Future telephone survey in the SNHPC Region (See i. Granite State Future Survey/Public Forum Results), the most common price range for a monthly internet bill is $50-$99 (29 percent). This is followed by monthly internet bills exceeding $100 (28 percent). A $20-$49 monthly internet bill is also fairly common, with 21 percent of respondents paying this amount. It is not clear however from this survey data if these prices include bundled services, which account for 79 percent of residents paying for internet services in the SNHPC Region. The UNH Survey Center that conducted the GSF survey found statewide, households earning less than $20,000 are less likely to pay for bundled internet service.

a) Comcast's Internet Essentials Program

As previously identified and discussed in this plan (see Executive Summary, Vision Statement, and Section 2 Regional Overview), the SNHPC Region is diverse, with areas of marginalized populations concentrated in certain communities that do not have or cannot afford broadband services. Many of these marginalized populations include low-income households, refugees, unemployed veterans, students and handicapped individuals who cannot afford to purchase a computer let alone pay for internet services. The provision of affordable broadband for these individuals is a major goal of this plan.

Figure 27: Internet Essentials

Source: Comcast

Internet Essentials from Comcast is the nation's largest and most comprehensive broadband adoption program. It provides low-cost broadband service for $9.95 a month plus tax; the option to purchase an internet-ready computer for under $150; and multiple options to access free digital literacy training in print, online, and in-person. A household is eligible to participate if:

- Located where Comcast offers internet service

- Have at least one child eligible to participate in the National School Lunch Program (NSLP)

- Have not subscribed to Comcast internet service within the last 90 days

- Does not have an overdue Comcast bill or unreturned equipment

Families that enroll in the program can continue to enjoy the service as long as one child eligible to
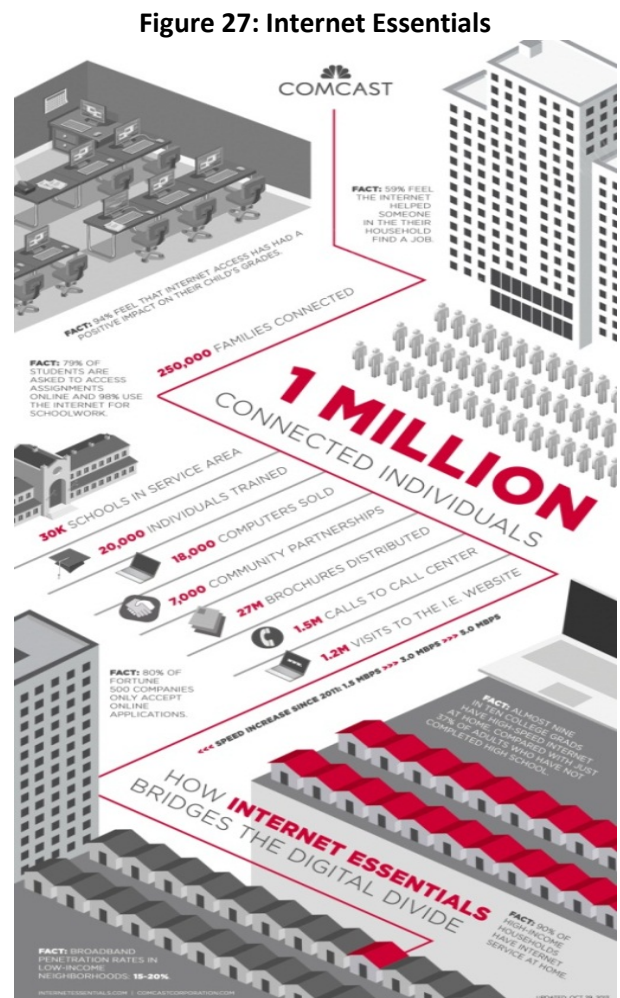
participate in the NSLP is living in the household.[51] Comcast increased the speed for Internet Essentials customers to 5 Mbps download speed and 1 Mbps upload speed.[52] Mark Reilly, Senior Vice President of Government Affairs for Comcast's Northeast Division surveyed families using Internet Essentials and found the program has produced the following promising results:

- 98 percent say their children use the internet for homework;

- 94 percent feel internet access at home has had a positive impact on their child's grades; and

- 59 percent feel the internet has helped someone in their household find a job.[53]

"Reilly said that, in Manchester, only 20 percent of those living in the inner city have Internet access at home. That compares to Bedford where 100 percent of residents have broadband, he said. Comcast Internet Essentials was an effort to bridge that digital divide." (Union Leader, October 11, 2013)

The Internet Essentials program allows residents in the SNHPC Region who meet the above criteria the opportunity to a discounted monthly rate on the internet and a computer. As shown in Table 13, Comcast serves 13 of the 14 municipalities in the region. Promoting the need for and working with other large ISPs to establish similar programs is an important goal and recommendation of this plan. Many of the largest service providers in New Hampshire have the ability to develop and offer similar programs that could also enable refugees, senior citizens and unemployed veterans, students and handicapped individuals to obtain internet access and find gainful employment. This is a major challenge and issue confronting broadband in the SNHPC Region as well as other parts of the state and nation.

To evaluate eligibility for the Internet Essentials program among the 14 communities in the SNHPC Region, the NH Department of Education collects statistics on students who are eligible for free/reduced lunches at school. As seen in Table 14, the SNHPC Region closely mirrors the State average of students who are eligible for subsidized lunches at school. However, upon closer inspection there is a wide disparity among the school districts within the region. The Towns of Windham and Bedford are among the school districts with the lowest proportion of students eligible for free or reduced lunches. In contrast, almost 49% of students attending Manchester's school district meet one of the four criteria to qualify for the Internet Essentials program. Additionally, the Derry Cooperative (27%) and Raymond (30%) school districts are both above the state average of students eligible for free or reduced lunches.

If families of these students have not subscribed to Comcast internet service within the past 90 days and they do not have an overdue bill or unreturned equipment, then the Internet Essentials program could be instrumental in making internet access affordable. For a detailed breakdown of free/reduced school

---

[51] http://www.internetessentials.com/how-it-works. Accessed 11/4/13.

[52] "The Goal: Internet Access for Everyone." Staff Report. Union Leader. 10/11/13.

[53] ibid.

lunch eligibility by individual schools in the SNHPC Region, please refer to Appendix F: Free/Reduced School Lunch by Individual School.

Table 14: Free/Reduced School Lunch Eligibility by District

District Name	Enrollment as of 10/01/2012[54]	Free/Reduced Eligible[55]	% Eligible
Auburn	558	81	14.52%
Bedford	4,118	205	4.98%
Candia	370	69	18.65%
Chester	517	59	11.41%
Deerfield	384	58	15.10%
Derry Cooperative	3,202	882	27.55%
Goffstown	2,690	426	15.84%
Hooksett	1,284	238	18.54%
Londonderry	4,301	470	10.93%
Manchester	13,794	6,741	48.87%
New Boston	473	50	10.57%
Raymond	1,308	393	30.05%
Weare	918	188	20.48%
Windham	2,585	128	4.95%
Regional Average	**36,502**	**9,988**	**27.36%**
State Average[56]	**171,180**	**46,659**	**27.26%**

Source: New Hampshire Department of Education

vii. Rural Addressing

The Rural Addressing Project is a component of the NHBMPP and is managed by the Nashua Regional Planning Commission (NRPC). The goal of the project is to develop a database containing a mapped point feature and associated street address for every residential address in the rural Census blocks in New Hampshire. Rural blocks are defined as having an area of at least two square miles. The 2010 Census figures have identified roughly 39,991 households within these rural blocks.

The resulting dataset from the Rural Addressing Project will be used to support efforts to show where broadband service (or lack thereof) is reported in these areas. By providing volunteer assistance, communities will be able to directly benefit from this project by helping to identify where broadband service is reported or not reported based upon street address. This street address dataset will also be helpful to the New Hampshire Department of Resources and Economic Development (DRED) as they work with service providers across the state to secure and utilize funding for broadband infrastructure and expansion.

---

[54] Enrollment adjusted to include children in grades 1 through 12 only.

[55] Free/Reduced Lunch Eligible count collected as of October 31, 2012. The count is adjusted to include children in grades 1 through 12 only. Count includes free milk eligible program.

[56] State and Regional Averages do not include Charter Schools.

4. Regional Demand for Broadband

i. Granite State Future Survey/Public Forum Results

During May-July 2013, the University of New Hampshire Survey Center conducted a telephone survey for New Hampshire's nine Regional Planning Commissions, as part of the *Granite State Future* and *New Hampshire Broadband Mapping and Planning* initiatives. Funded in part by a grant from the U.S. Department of Housing and Urban Development, *A Granite State Future* is intended to engage New Hampshire citizens in a public dialogue at the local, regional and state levels, about what they want for the future of their communities and state. Results from the survey will inform updates to the Regional Master Plans in each of NH's nine planning regions. These regional plans are advisory documents designed to provide municipalities with data and strategies to support local decision-making, as well as to enhance regional cooperation. Results from the survey will inform the broadband plans developed in each of NH's nine planning regions.

A total of 2,935 New Hampshire adults were contacted by telephone by UNH staffers between May 9 and July 21, 2013 in conducting the survey. The overall response rate was 33 percent and the margin of sampling error for the survey was +/- 2.2 percent.[57]

Survey Results

Many of the survey responses obtained within the SNHPC Region closely mirror statewide responses; however, a select few are noted for their difference. Of prime importance, 93 percent of the region's residents report having access to the internet at home (See Table 15). Overall, the UNH Survey Center found statewide those who are 70 or older, those unemployed and looking for work, those with a high school education or less, and households earning less than $20,000 are less likely to have internet access at home. Results for the City of Manchester may differ from the region as a whole, considering the city's socio-economic characteristics, such as median household income and unemployment rates discussed earlier.

Table 15: Internet Access at Home

Do you have access to the internet at home?

Respondents	Yes	No	Don't know	Number responding
Statewide	91%	9%	0%	2925
SNHPC Region	**93%**	**7%**	**0%**	**591**

Source: Granite State Future 2013 Statewide Survey

Table 16 reveals there are several reasons why 7 percent of the region's residents do not have internet access at home, many of which are related to social preferences. 29 percent of respondents claimed they don't need the internet and 10 percent said they don't know how to use it. These answers may be related to differences between generations. Of those who don't have internet access at home, 13 percent do not have a computer that can adequately handle internet connections, while 17 percent

---

reported internet service is too expensive. Identifying and implementing strategies addressing the affordability of broadband will help decrease the number of people unable to access internet at home.

The majority of residents within the SNHPC Region utilize cable-based broadband internet (79 percent) while DSL generates the second most common type of internet connection (See Table 17). Compared to statewide types of internet connections, residents in the Southern New Hampshire Region use cable internet more. 4 percent of respondents in the region report using fixed wireless, while only 3 percent have a fiber-based connection at home.

Table 19 explores why residents use their current internet providers. The two most common responses are that it was the only provider and "other" (31 percent). About 24 percent stated that they were happy with their current service provider.

Of those respondents who knew what their monthly internet bill was, the most common price range indicated is $50-$99 (29 percent), followed by monthly internet bills exceeding $100 (28 percent) (See Table 20). A $20-$49 monthly internet bill is also fairly common, with 21 percent of respondents paying this amount. These prices are not clear if they include bundled services, which account for 79 percent of residents paying for internet services (See Table 21). The Survey Center found that statewide, households earning less than $20,000 are less likely to pay for bundled internet service.

Additionally, The Survey Center found those who are 70 or older, retired people, those with a high school education or less and households with an income of less than $20,000 are less likely to shop online. Millennials are found to be more likely to watch videos online, while conversely, those who are 60 or older are less likely to watch online videos.

With 93 percent of the region's residents having access to broadband at home, 94 percent report being pleased with their internet connection at home for their uses (See Table 26). This response rate signifies that the popularly-utilized cable internet connection serves the region's population well.

A strong majority of residents (87 percent) are uninterested in paying more per month for a faster internet connection (See Table 27). With such an overwhelming majority of respondents stating their connection is adequate, paying more for a faster connection will not yield significant benefits.

Of particular importance to local elected officials, residents were asked if they would support their municipality funding the expansion of broadband access to existing and potential development. 56 percent of respondents oppose a municipality using any funds for broadband (See Table 28). Of the 40 percent who favored the use of municipal funds for broadband, 22 percent stated they would accept higher taxes for the service, while 18 percent would prefer a different funding mechanism used other than taxes.

Tables 16 through 28 are provided on the following pages.

Table 16: Reasons for not having Internet

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

Respondents	It is not available where I live	I have access at another place such as my job	It is too expensive	I don't know how to use it	I don't need it	I don't have an adequate computer	Some other reason	Don't know	Number responding
Statewide	5%	9%	20%	8%	26%	9%	21%	2%	262
SNHPC Region	**0%**	**5%**	**17%**	**10%**	**29%**	**13%**	**27%**	**0%**	**43**

Source: Granite State Future 2013 Statewide Survey

Table 17: Types of Internet Connections

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

Respondents	Dial-up	DSL	Cable	Fixed wireless	Cellular	Satellite	Fiber	Other	Don't know	Number responding
Statewide	1%	16%	68%	5%	2%	2%	2%	1%	3%	2646
SNHPC Region	**1%**	**9%**	**79%**	**4%**	**1%**	**0%**	**3%**	**2%**	**1%**	**547**

Source: Granite State Future 2013 Statewide Survey

Table 18: Why Dial-up/Satellite?

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

Respondents	Only available option	Too costly to change	Too much effort to change	Learning curve is too steep	I don't know what other options are available	Other	Don't know	Number responding
Statewide	26%	9%	2%	2%	2%	10%	49%	158
SNHPC Region	**0%**	**11%**	**0%**	**0%**	**0%**	**17%**	**72%**	**9**

Source: Granite State Future 2013 Statewide Survey

Table 19: Current Provider Choice

Why are you using your current provider?

Respondents	I'm happy with my current provider	Only option available	Too costly to change	Too much effort to change	Learning curve is too steep	I don't know what other options are available	Other	Don't know	Number responding
Statewide	22%	39%	5%	3%	0%	2%	23%	6%	2631
SNHPC Region	**24%**	**31%**	**3%**	**4%**	**0%**	**1%**	**31%**	**6%**	**545**

Source: Granite State Future 2013 Statewide Survey

Table 20: Monthly Internet Bill Prices

What is your monthly internet bill?

Respondents	Less than $20	$20-49	$50-99	$100 or more	Don't know	Number responding
Statewide	3%	25%	29%	24%	19%	2590
SNHPC Region	**1%**	**21%**	**31%**	**28%**	**19%**	**537**

Source: Granite State Future 2013 Statewide Survey

Table 21: Bundled Services

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

Respondents	Yes	No	Don't know	Number responding
Statewide	76%	22%	2%	2624
SNHPC Region	**79%**	**20%**	**2%**	**545**

Source: Granite State Future 2013 Statewide Survey

Table 22: Email

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?

Respondents	Do not check email at home	Do, but connection is slow	Do, and connection speed is adequate	Don't know	Number responding
Statewide	4%	5%	90%	1%	2622
SNHPC Region	**4%**	**3%**	**93%**	**0%**	**542**

Source: Granite State Future 2013 Statewide Survey

Table 23: Shopping Online

Do you use the internet to shop online at home?

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

Respondents	Do not shop online at home	Do, but connection speed is slow	Do, and connection speed is adequate	Don't know	Number responding
Statewide	19%	5%	75%	0%	2622
SNHPC Region	**18%**	**5%**	**77%**	**0%**	**541**

Source: Granite State Future 2013 Statewide Survey

Table 24: Online Videos

Do you use the internet to watch online video, such as 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?

Respondents	Do not watch online video at home	Do, but connection speed is slow	Do, and connection speed is adequate	Don't know	Number responding
Statewide	37%	10%	53%	1%	2622
SNHPC Region	**32%**	**8%**	**60%**	**0%**	**542**

Source: Granite State Future 2013 Statewide Survey

Table 25: VPN

Do you use the internet to connect to other computers using VPN (Virtual Private Network) at home?

Respondents	Do not connect to other computers at home	Do, but connection speed is slow	Do, and connection speed is adequate	Don't know	Number responding
Statewide	66%	4%	27%	2%	2612
SNHPC Region	**60%**	**7%**	**32%**	**1%**	**542**

Source: Granite State Future 2013 Statewide Survey

Table 26: Adequate Internet Connection?

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

Respondents	Yes	No	Don't know	Number responding
Statewide	92%	7%	1%	2630
SNHPC Region	**94%**	**5%**	**1%**	**544**

Source: Granite State Future 2013 Statewide Survey

Table 27: Paying for Faster Internet Speeds

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

Respondents	Nothing	25% more per month	50% more per month	Don't know	Number responding
Statewide	85%	11%	2%	3%	2622
SNHPC Region	**87%**	**9%**	**1%**	**3%**	**543**

Source: Granite State Future 2013 Statewide Survey

Table 28: Using Municipal funds for Broadband Access

Do you favor or oppose using municipal funds to provide broadband access to existing and potential development?

If Favor: Would you be willing to pay higher fees or taxes to pay for it?

Respondents	Favor higher taxes	Favor no taxes	Oppose	Don't know	Number responding
Statewide	26%	16%	51%	6%	2910
SNHPC Region	**22%**	**18%**	**56%**	**4%**	**589**

Source: Granite State Future 2013 Statewide Survey

ii. UNH Speed Test Survey Results

In order to supplement public outreach efforts verifying local broadband service as well as advertised speeds by Internet Service Providers, the University of New Hampshire developed a speed test and a short survey for residents across the state to share. When participants selected the speed test application at www.iwantbroadbandnh.org, both download and upload speeds were measured at the reported location of the user. Table 29 displays the total number of speed test and survey participants by municipality in the SNHPC Region, as of September 2013. The most speed tests completed were in the City of Manchester and the towns of Derry, Goffstown and Bedford.

Figure 28: Speed Test Instruments
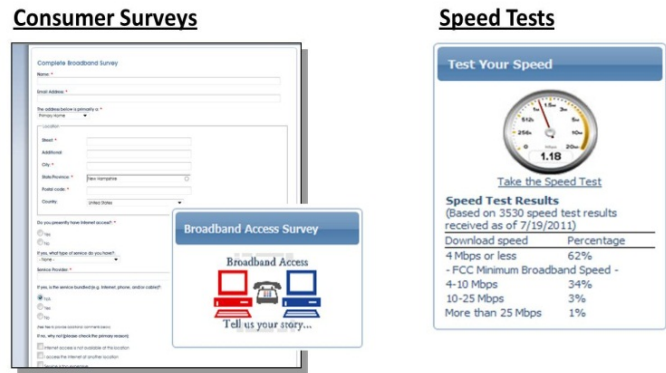
www.iwantbroadbandnh.org

Source: www.iwantbroadbandnh.org

Table 29: Completed Speed Tests and Surveys

Municipality	Speed Tests	Surveys
Auburn	1	0
Bedford	21	0
Candia	7	0
Chester	15	0
Deerfield	16	2
Derry	71	1
Goffstown	28	2
Hooksett	5	0
Londonderry	14	2
Manchester	70	1
New Boston	6	1
Raymond	11	1
Weare	11	1
Windham	7	1
Regional Total	**283**	**12**

Source: New Hampshire Broadband Mapping and Planning Program, September 2013

iii. Sector-Based Analysis

Between October 2012 and February 2013, the Broadband Stakeholders Group (BSG) and the SNHPC conducted broadband surveys and facilitated a concentrated public outreach effort (Focus Group Exchanges) among the following sectors of the region:

- Business/Economic Development – held on November 7, 2012
- Health – held on November 8, 2012
- Public Safety – held on November 15, 2012
- Education – held on November 15, 2012
- Community Support/Government – held on November 20, 2012

Figure 29: Broadband Stakeholders
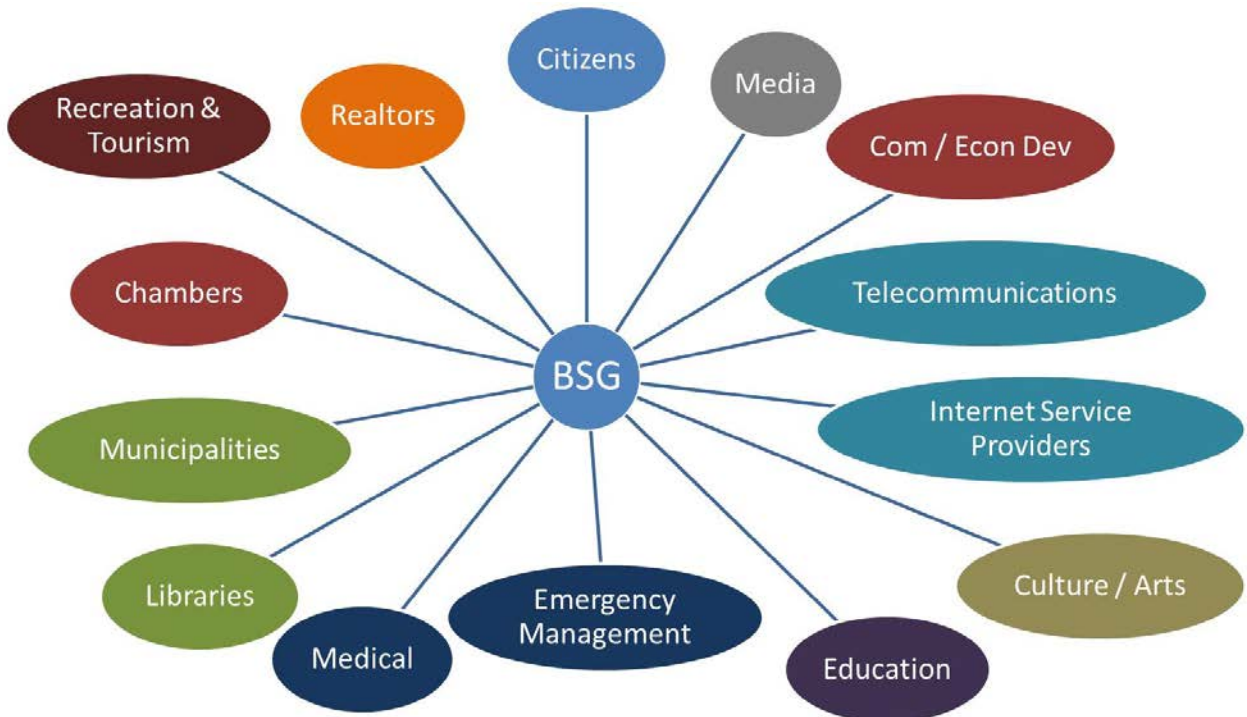
Source: SNHPC

The purpose of these *Focus Group Exchanges* was to provide an opportunity for public input and discussion of the region's business/economic development, health, public safety, education and community support/government broadband needs.

In addition, another public forum was held on October 3, 2013 to obtain a wider public review of this draft plan, including a specific focus on residents in the region. Existing underrepresented and lower-income households and neighborhoods were also extended invitations to attend this public forum.

Figure 30: October 3, 2013 Broadband Public Forum

Source: SNHPC

The various sector-based broadband surveys distributed by the BSG and SNHPC were prepared by staff at UNH (See Appendix F: Sector Focus Group Survey Summary). These surveys were prepared as excel spreadsheets and distributed both electronically by email and by mail to many existing businesses, companies, health organizations and hospitals, public institutions, school districts, local government facilities, libraries, etc. in all 14 communities in the region. This survey is the first time broadband information and specific sector-based questions have been asked within the region.

In total, there were 18 returned surveys and five focus group sessions that dealt with the following topics for each of the five sectors:

- Identified needs
- most important sector needs
- technology-related challenges
- what could help overcome challenges
- future strategic plans
- broadband development in this region

Of these subjects, "Identified needs and technology related challenges" had the most consistent responses between the various sectors. Similarly, the responses to "what could help overcome challenges" had many commonalities amongst the sectors. The most common challenges and needs identified were greater monetary resources and funding, greater network redundancy, and better training and IT support.

A summary of the survey results and sector focus group exchanges is presented as follows:

a) Education

The greatest challenges identified by the education sector are the lack of sufficient funding to cover the costs of higher speed broadband services, dedicated IT staff, and keeping up with ever-changing technologies. Additional challenges include a lack of knowledge of the services available and a lack of training to keep pace with changing technologies. Many school districts throughout the region are provided free or reduced tiered pricing for broadband service as part of their municipality's cable franchise agreement. However, the broadband speed provided varies considerably from town to town depending on the service provider. While faster services may be available from the same service provider, the additional cost may not justify the increase in speed. Internet service is thus a major decision left to individual towns, and the franchise agreement with service providers. There are a total of 12 School Administrative Units (SAUs) within the region.[58] Due to the nature of the franchise agreements, each District/SAU must work cooperatively with their municipal governing board to address internet services and fees.

Figure 31: Education Sector Analysis Focus Group

Source: SNHPC

Education Sector Focus Group Attendees:
- Deb Boisvert, Deerfield Community School
- Andre Garron, UNH-CE
- Jack Munn, SNHPC
- Robert Piatkowski, SNHPC

b) Health

Amongst the larger health institutions and hospitals, the chief concerns dealt with redundancy and data security. Redundancy at multiple levels was of key importance in the region. Having more than one connection to a fiber loop was deemed critical in maintaining constant network access, as was having connection(s) to multiple service types such as fiber, Metro Ethernet, Cable, Cellular, etc. Redundancy in power supply by means of backup generators or batteries was also described as important. Data security was another concern of the health sector since much of their data contains confidential patient information. The data must also always be available for treatment purposes. It was mentioned that cloud computing offers some advantages, but until it is proven to be at least as secure and reliable as the hospital's own system, a move to cloud computing will be a slow transition. Smaller healthcare providers face different challenges, similar to those faced by other small businesses and organizations. These include keeping up with the fast changes in technology and limited resources.

---

[58] http://my.doe.nh.gov/Profiles/PublicReports/PublicReports.aspx?ReportName=SAUList. Accessed August 13, 2013.

In 2010, over 500 healthcare sites across Northern New England were awarded a $24 million grant from the FCC as part of the Rural Health Care Pilot Program (RHCPP).[59] The purpose of this program is to establish a nationwide broadband network of health care sites. The participants in New Hampshire, Maine and Vermont came together to form the New England Telehealth Consortium (NETC) with the purpose to improve the capability and efficiency of healthcare using broadband technologies among rural communities. One of the goals of the project includes developing the necessary telehealth infrastructure along with improving the transmission of electronic health records to share among healthcare sites.

Health Sector Focus Group Attendees:
- Brian Tew, Catholic Medical Center
- Jack Munn, SNHPC
- Robert Piatkowski, SNHPC

c) Community Support/Government

Many of the challenges for the government and community support sectors are tied to budget constraints. This includes a lack of resources for better technology and tech support. Other technology-related challenges are limited internet speed and inconsistent service from the provider. Libraries have become popular destinations for internet access and use, as they tend to be connected to high-speed broadband networks even when the surrounding rural communities might not have connections. The creation of public Wi-Fi hotspots throughout various community locations has generated much interest.[60] The City of Manchester, through a Chamber of Commerce and private sector effort, established free Wi-Fi along Elm Street in the downtown area ten years ago. Through support of this broadband plan, the City of Manchester is involved again in pursuing a grant, with private sector partnership, in establishing a city-wide free Wi-Fi program. It is hoped that such services and greater broadband connections will attract more businesses and customers to Manchester.

A challenge unique to municipalities is negotiating cable franchise agreements. It can be difficult for a town to negotiate a contract to the town's benefit if specific expertise in this area is not available. Additionally, when pursuing other technologies via the franchise agreement, such as creating an institutional network (iNet) between all municipal and school buildings, the costs will likely require multi-year agreements which may be difficult to secure through town/school board approvals. One strategy to ensure better negotiations of such agreements has been recently implemented by several municipalities and school districts. They are working together to pool their resources to hire legal assistance specializing in cable franchise agreements, which will help them gain more influence in the negotiations. Currently, only the City of Manchester in the region publicly owns the fiber backbone connecting many city facilities and departments.

---

[59] New England Telehealth Consortium, http://netelc.org/about.html (accessed 3/26/14).

[60] Currently, two towns in New Hampshire, Portsmouth and Nashua, have or will implement free public Wi-Fi in their downtowns.

Community Support/Government Focus Group Attendees:

- Brian Olsen, Bedford
- Deb Lievens, Londonderry
- Jack Munn, SNHPC
- Robert Piatkowski, SNHPC

d) Public Safety

One of the concerns raised by the survey and focus group exchange is the implementation of emergency response networks. Specifically, whether to pursue a publicly-funded private network dedicated to public safety or to use a service carrier to provide bandwidth on their network. Building and maintaining a private broadband network is costly, requiring a high level of commitment, and is a community by community decision. However, it has many advantages, primarily that the entire bandwidth is dedicated for emergency response uses. Utilizing a private carrier's network would reduce the need to construct new infrastructure and future maintenance – this would be the responsibility of the provider, but it is unclear whether bandwidth would be dedicated to emergency response uses during times of emergency or if it would have to compete with other paying users.

Another concern involves coordination amongst the multiple agencies at the various levels of government in implementing an emergency response network and sharing resources and communications equipment. For redundancy purposes, there are many modes of communication that can be employed. These include fiber, microwave, cable, telephone, wireless, and HAM radio. Using a combination of these modes provides multiple options, should one or more segments of the communications network become inoperable.

Costs are a limiting factor for many municipalities' emergency response departments, limiting the speed of their broadband connection and network redundancy. Some towns, such as Bedford and Londonderry, are looking to implement wireless broadband connections between dispatch centers and emergency response vehicles, including the J1 System and RED ALERT. However, these systems can be very expensive for smaller municipalities to implement. One possible method to reduce costs is to regionalize dispatch centers, which use mobile broadband and other services, such as J1, which would allow costs to be shared between several towns. Another key issue raised is the status of the state of NH's FirstNet program.[61] Many public safety and local IT officials have expressed concern that limited progress is being made in unrolling this program to the public and they have been requesting a public information forum be held to provide officials with more information.

---

[61] FirstNet is an agency within the National Telecommunications and Information Administration (NTIA) with the purpose to create a framework for the network and secure nationwide standards for use and access to the network among all states. This network is exclusively to link law enforcement, emergency management, fire, public works, and EMS. (http://www.illinois.gov/firstnet/Pages/default.aspx) Accessed August 13, 2013.

Public Safety Focus Group Attendees:

- Carol Miller, DRED
- John Bryfonski, Bedford Police Department
- John Vogl, Town of Londonderry
- Jack Munn, SNHPC
- Robert Piatkowski, SNHPC

e) Business/Economic Development

Among the region's business community, network resilience, redundancy, and power backup are also major concerns. Power backup requires having multiple internet connection options available, such as fiber optic and wireless networks, as well as having the option to connect to a fiber loop and employing back-up generators. Other challenges identified by businesses and economic development officials are keeping up with changing technology, a lack of knowledge of all available service options in the region, and limited knowledge and abilities in terms of using the internet and new technologies to their full potential. Potential solutions discussed include hiring dedicated IT staff and having them attend educational courses; however, this was viewed as expensive and a limiting factor for many businesses and organizations.

Figure 32: Economic Development & Business Sector Analysis Focus Group

Source: SNHPC

The survey and focus group discussion also made clear the importance of broadband availability for economic development and business location decisions in the region. Businesses seek locations with high broadband speeds and multiple service providers; businesses located in unserved or underserved areas face a distinct disadvantage. To attract new businesses, both large and small, broadband service and connectivity is a must.

Business/Economic Development Focus Group Attendees:

- Dan Reidy, UNH Cooperative Extension
- Ellen Scarponi, FairPoint Communications
- Tony Matos, Altos Marketing
- Ron Fredette, KW Commercial
- Andrea O'Brien, NH Small Business Development Center
- Shani Luccey, and Husband
- Matt Mercier, Acapella Technologies
- John Nachilly, PSNH
- Elmer Pease, PD Associates, LLC
- Mike Koustas, Waveguide
- Jack Munn, SNHPC
- Robert Piatkowski, SNHPC

"'Dyn is a great example of New Hampshire natives building and growing a highly successful company here, when they could have gone elsewhere,' Cookson said. 'The company is also very committed to supporting additional new ventures and enhancing our innovation economy, which is terrific. As a tech community, we need to nurture our future Dyns, fund them, mentor them and grow them, as we all benefit from a strong tech ecosystem in NH that creates higher paying jobs, advances economic development, and demonstrates our entrepreneurial culture. Dyn is incredibly supportive of the High Tech Council and if we can build and grow more companies that have this commitment to New Hampshire, we all benefit.'"
("Manchester Firm Dyn Still Growing", Staff Report, Union Leader, February 11, 2014)

E. Challenges to and Opportunities for Regional Broadband Implementation and Improvement

1. Introduction

In the world of broadband, much of what is happening with the internet today is largely driven by new technologies and the needs in the marketplace. As a largely unregulated industry, access to the internet in the Southern New Hampshire Region (and throughout New Hampshire) is highly dependent upon where one lives and works in regard to the broadband infrastructure and service(s) currently available.

Despite current and ongoing infrastructure expansion and new broadband technologies such as wireless, the BSG believes there are still many scattered locations, remote and underserved areas that need high-speed broadband infrastructure – e.g. the fiber optic cables, which can carry signals via light rather than electricity. These cables have vastly more capacity than wire or coax cables and make it possible to have internet speeds as high as 50 or even 100 megabytes per second.

While the BSG recognizes satellite internet is available within the entire region, this technology is currently much slower than fiber optics and does not offer the speed or the consistency many businesses and residential users want or need today in order to compete in the global marketplace. DSL, or broadband over "twisted pair" copper phone lines is also available throughout much of the region. However, there are still many remote or isolated locations at the "end of the line" or at the limit of a repeater used to boost signals where DSL does not exist or the available service generally falls short of acceptable modern standards (e.g. barely more than a megabyte per second for downloading or uploading, and often less).

These "end of the line" scattered and remote locations are being identified in many of the region's communities – both suburban and rural – through the New Hampshire Broadband Mapping and Planning Program (NHBMPP). Through initial mapping efforts the communities within the region identified with the slowest internet services available include the towns of Auburn, Candia, Chester, Deerfield, New Boston, Raymond and Weare. The towns of Bedford, Derry, Goffstown, Hooksett, Londonderry and the City of Manchester, while having greater broadband infrastructure in place and more internet service choices available, still have isolated pockets and areas which are either not served or underserved. In short, the physical geographic constraints and infrastructure expansion limitations pose the greatest problem and obstacle for increasing the availability of broadband services in the region.

Numerous meetings of the BSG held between June 2012 and March 2013 identified a number of key challenges and opportunities for regional broadband implementation and improvement. This section provides a summary of the region's key broadband issues and needs categorized into four topic areas. These include: Regulatory, Economic, Social, and Technological.

2. Barriers

i. Regulatory Barriers

1) The adjoining states of Maine, Massachusetts, and Vermont all have a broadband authority in place, while New Hampshire currently does not. A broadband authority is a designated office that manages a state fund that makes awards to broadband projects in-state. This has positive benefits for expanded business growth and the residential market.

2) Remove legislative barriers to municipalities bonding for broadband infrastructure by lessening restrictive clauses that limit bonding to unserved areas. Allow bonding for non-discriminatory open access and inadequate capacity.

3) Many municipalities in the region have adopted cable franchise agreements with providers, but these agreements are typically not focused on broadband. Municipalities can explore legal options in perhaps utilizing franchise fees collected through these agreements to help expand service and run broadband cable to underserved areas in the community. In addition, technology grants from providers could be obtained through the cable franchise agreements to help fund necessary local cable networks, public access television stations and information technology upgrades and improvements.

4) Municipalities can also be more proactive in identifying rights-of-way and assisting and partnering with local community groups seeking expanded broadband services to remote locations. Typically there is adequate cable in the street, but expanding DSL for example is often a distance/cost issue.

5) "Make Ready" – making poles ready to accept broadband wire or cable has been a long-term problem throughout the state and the SNHPC Region as many existing poles are owned by the electric and/or telephone companies and getting approval can take many months to attach fiber. There is also a fee each broadband service provider must pay to install their wires/cables on these poles, thus making broadband deployment expensive and time consuming.

6) It is still difficult in many municipalities in the region to site cell towers due to difficult zoning regulations which discourage certain types of towers. While this is not true in all municipalities, the technology is changing and with increasing demand for more enhanced mobile and wireless devices many large towers are being replaced with smaller systems which can be concealed in church steeples and other similar locations. Many existing dead zones in the region's communities are being addressed in this way.

7) Municipal planners and planning boards also need to keep up with state laws about cell towers and examine local telecommunications ordinances to determine if they pose obstacles to broadband deployment.

8) Municipalities could also require, as in many other parts of the world, new buildings be built with conduits for the installation of the broadband fiber optic lines when the infrastructure becomes readily available.

ii. Physical/Economic Barriers

1) The key economic barrier confronting many stranded areas within the region's rural and suburban communities is the cost to provide the infrastructure. To expand service to larger lots, back lots, and lots with long driveways is expensive. According to Carol Miller, Broadband Coordinator with

the New Hampshire Department of Economic and Resources (NHDRED), the typical funding formula often used by providers to schedule service is a minimum of at least 16 homes per mile, including a survey fee of $150 and a connection fee of roughly $200, in addition to the price of the fiber per household. The demand for broadband services, as a result, is often not enough to pay for the investment required to deliver the service to these locations.

2) Topography and hilly terrain present physical barriers and it is not always feasible or economically possible to wire all locations. Forested landscapes also make service deployment challenging, especially for wireless providers.

3) All the municipalities in the region, except for the City of Manchester and Town of Deerfield, do not have broadband plans in place – either as part of the master plan or as a business plan for the community. Municipalities need to consider conducting an assessment of existing broadband services and needs in their communities in order to identify and plan for service expansion and infrastructure. Residents and businesses can utilize the broadband resources and community assessment tools available at: www.connectingcommunities.info to develop local leadership teams, conduct surveys and identify specific projects and actions to improve broadband connectivity. In addition, several communities could also work

Figure 33: August 29, 2013 Broadband Stakeholders Group Meeting

Source: SNHPC

together in a cooperative fashion to help develop and expand broadband infrastructure.

4) Education and limited public funding to build new/expand existing infrastructure continues to be an issue for many communities. Currently one of the only available sources of funding to help communities is the USDA Community Connect Grants. These grants are available to low-income communities to help expand broadband infrastructure and capacity.

5) Limited competition in many of the region's underserved communities can also result in higher broadband costs and limited service choices. Greater competition among broadband providers is needed to expand services and lower costs in general. Broadband rates available to the public in the Southern NH Region are currently much higher than rates for similar services available in Boston and other urbanized areas outside of New Hampshire. These urbanized areas have higher population densities to support greater and less expensive broadband services.

iii. Social Barriers

1) Many internet providers have strong lobbying power and interest in limiting competition within the region and state. This is both a territorial and political issue.

2) Consumers need more information about the performance (reliability and advertised speeds) of available broadband services. Lack of such information may prevent consumers from being able to accurately compare services and costs.

3) Organizations and businesses are concerned about privacy and security as data becomes increasingly digitized and moves to cloud-based platforms and services.

4) Computers and use of the internet is still a relatively new technology to many low-income households and those with English as a secondary language, and this contributes to low broadband adoption and use. Promoting greater access to internet education and training will help to address and overcome this issue. More importantly, promoting greater competition in the marketplace will also help to drive internet service costs down.

5) For people with disabilities, the internet offers greater opportunities to become a part of and stay involved in the workforce through remote locations. Therefore, access to the internet is critically important and must be made available to all.

iv. Technological Barriers

1) Most of the SNHPC Region has in place basic internet services available primarily through cable service providers. Fiber-backed DSL service is also relatively available throughout the region, except for rural areas. Advertised download speeds vary considerably throughout the region depending upon the available technology and service – cable modem, terrestrial fixed, satellite, etc.

2) In underserved communities, such as the Town of Deerfield, there is limited to no DSL broadband availability and very limited to no terrestrial-fixed wireless internet services. The lack of DSL and wireless services is a major economic disadvantage for the community's future growth and economic development.

3) Overall access to faster speeds is directly tied to the availability of services, costs and available technology. Bringing broadband consumer costs down to Boston-area levels is an important broadband need for the region.

4) Building more local municipal-owned fiber optics networks for public safety and improving overall service connections within communities is another critical need and issue.

a) Wireless Communication Towers

Wireless communications are served by cell towers, which are located in every municipality of the region except for Deerfield and Windham (See Figure 35). Concentration is higher along major interstates and state highways, although the past few years have witnessed increasing service even in rural areas of the region. The construction of new towers is a highly regulated issue for planning and zoning boards who mitigate between the increasing need for wireless services and the aesthetic preservation of the town. Chester, Derry, Weare and Windham already have Telecommunications Overlay Districts while the remaining towns in the region encourage or mandate companies to use existing tower facilities rather than constructing new ones. Towers have setback, design, and zoning regulations. All towns should adopt strict regulations that force competing companies to cooperate on the use of telecommunications infrastructure and transmission structures in order to minimize impact to town and increase the efficiency of communications systems.

Figure 34: Hoyt Cell Tower, Town of Chester

Source: NH OEP

With the widespread adoption of cell phones, research in recent years has identified a growing trend among households cancelling their landline phone service to rely solely on their mobile phone.[62] In June 2010, the National Center for Health Statistics reported more than one-in-four (26.6 percent) households did not have a landline phone and only had a wireless phone. According to an article in USA Today, researchers identified both renters and low-income households are more likely to be wireless-only homes. Charles Govin, of Forrester Research, states that young people growing up with cell phones see no need investing in a landline.[63] An established mobile phone number remains with the owner over the years, saving someone from changing their contact information any time they were to move to a new location. Carrying a cell phone on-hand provides the added benefit of flexibility and increased availability. The increasing reliance on cell phones as the primary means of communication have caused wireless communication towers to be considered vital infrastructure for residents of any community.

> *"'The phrase 'home telephone number' is going the way of rotary dial phones and party lines,' says Stephen Blumberg at the Center for Disease Control and Prevention's National Center for Health Statistics. The trend toward wireless-only homes shows no sign of slowing down, it said."*
> *("More people ditching home phone for mobile", USA Today, April 21, 2001)*

---

[62] Snider, Mike. "More people ditching home phone for mobile," USA Today, April 21, 2011. (http://usatoday30.usatoday.com/tech/news/2011-04-20-cellphone-study.htm) Accessed March 4, 2014.
[63] ibid.

Figure 35: Existing Wireless Communication Towers

3. State, Regional and Local Broadband Resources and Opportunities

i. Statewide Broadband Plans

As the construction contractor for Network NH Now (NNHN), Waveguide technicians are installing more than 750 miles of optical fiber along roadways throughout the state. When complete, this network will provide a high-capacity communications backbone that will allow local providers to bring high-quality voice, video and data services to all 10 counties in the state.

As a public-private partnership, the NNHN project is made possible thanks to federal economic stimulus funds, as well as private contributions. Much like the Eisenhower Interstate Highway System of the 1950s did for the nation's transportation infrastructure, Network New Hampshire Now (www.networknhnow.org) will bring a comprehensive and forward-thinking broadband highway to communities all across New Hampshire, fostering economic growth, job creation, improved communication, and affordable high-speed internet access. Figure 36 shows the current NNHN three statewide projects: Middle-Mile Fiber; FastRoads; NH DOT connections; and Microwave improvements.

Figure 36: Network New Hampshire Now Concept Map
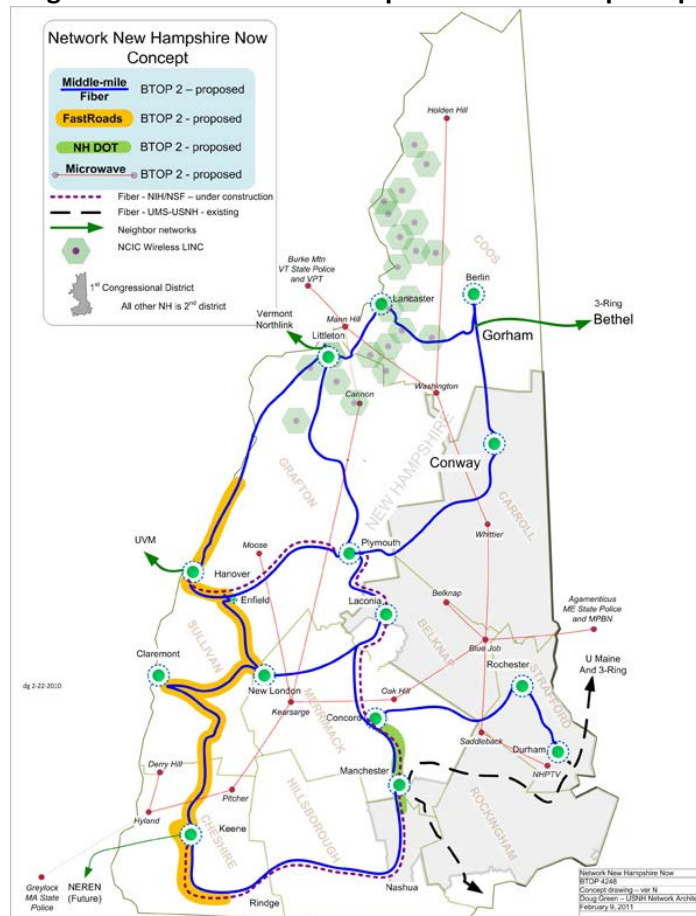
Source: http://www.unh.edu/networknhnow/route_options_map.html

In addition to the NHHN project, there is an opportunity as part of Public Service New Hampshire's (PSNH) Northern Pass project (if it is approved by the state) to incorporate "backbone" broadband infrastructure along the utility right-of-way (ROW). Of regional importance, the southern terminus of the Northern Pass Project is located in Deerfield (See Figure 37).[64] The development and installation of a spine network of broadband fiber to the home could be leveraged through the Northern Pass project by local and state officials such as NH DRED to provide broadband access and connectivity in this "unserved" community.

Figure 37: Northern Pass Route in Deerfield
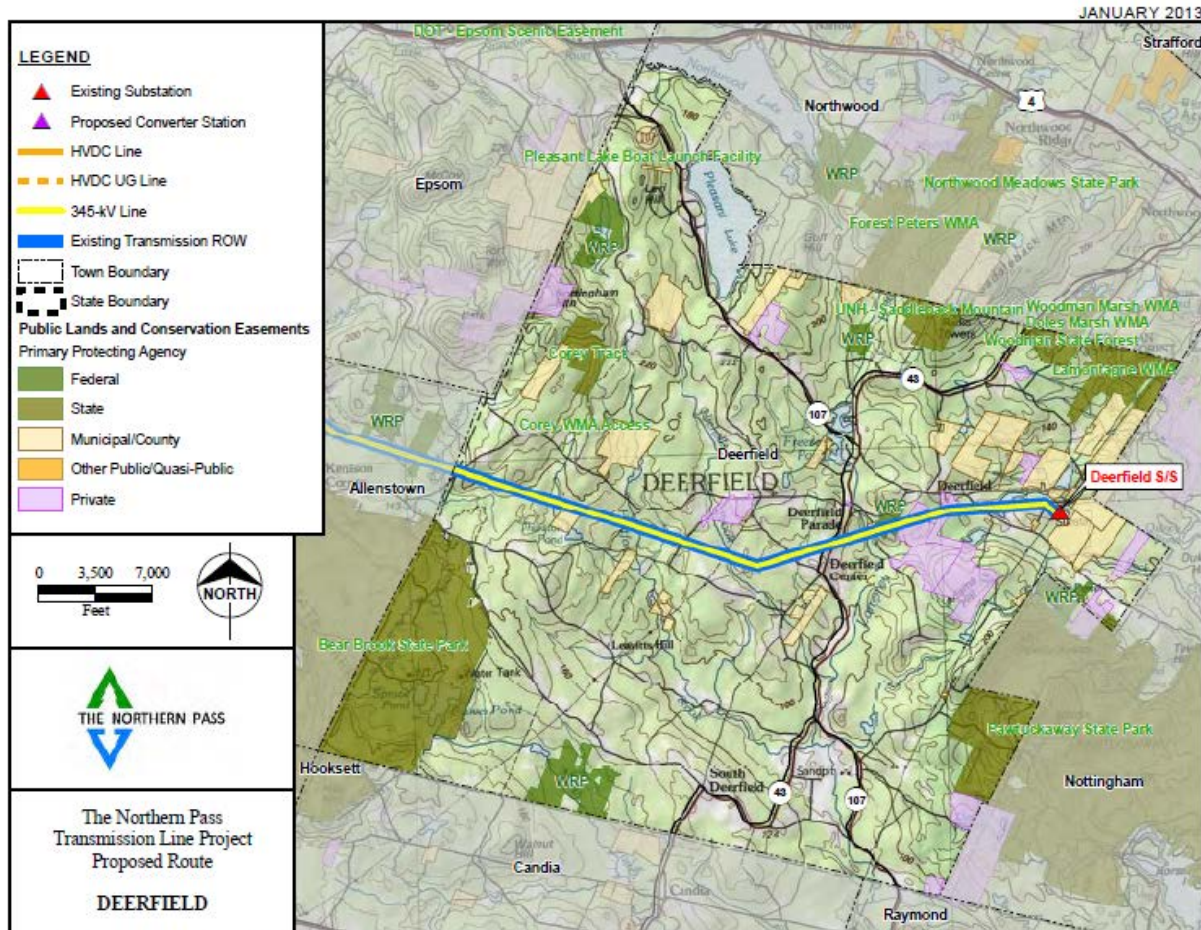
Source: Public Service of New Hampshire

In addition, NH DRED has been active in New Hampshire and throughout the SNHPC Region in promoting initiatives aimed at expanding broadband access and connectivity, in addition to assisting and partnering in such regional efforts as the development of this plan.

---

[64] http://www.northernpass.us/news/press-releases_2.htm) (Accessed July 9, 2013)

ii. Local & Regional Broadband Needs, Goals and Potential Projects

Between April-July 2013, the SNHPC, with BSG support, contacted the region's municipalities, counties, and key state agencies and stakeholders, seeking current information regarding each governmental unit's broadband needs, goals, and future broadband plans and projects. To date, only a few agencies and municipalities have responded and before this plan is completed, SNHPC staff will be scheduling follow up meetings with key staff and IT Directors in each community where broadband infrastructure improvements are being planned or are in the works, including those communities where broadband capacity and availability is limited. The following local government responses have been received to date:

a) Town of Windham

Most Pressing Broadband Needs:

- Expanding broadband service that meets the needs of current and future businesses in non-residential areas of the town.

- The Town of Windham and local broadband customers need a broadband backbone which would provide a few more hours of internet access (fiber & phone) in the event or loss of power.

Key Broadband Goals:

- Ensure all interested users, whether residential or commercial, have access to broadband services that meet their needs.

- Ensure all public safety-related services and departments are served by *dependable* broadband.

Key Plans and Recommendations:

- Broadband is part of the community's infrastructure, much like roads and stormwater facilities. Municipalities should be able to invest in this infrastructure as necessary through use of bonds, impact fees (broadband-specific or public safety), TIF Districts and ED grants, for example.

- We should not try to change the free market or force service providers to go into certain areas; however, as communities invest in infrastructure the providers will come because they will see a market.

b) Town of Bedford

<u>Most Pressing Broadband Needs:</u>

- Installing broadband infrastructure between the town office building, library, police, fire and schools to build a "whole community" network and improve connectivity.

- The town considers its IT/broadband connectivity needs critical to the operations of the town and as a result IT has a place and permanent seat in the emergency operations center, and is an active and contributing member of our emergency management working group.

<u>Key Broadband Goals:</u>

- The ability to plug into a network jack at any town or school building and be able to have full access to any of the critical information that police, fire, and town government depend on to function.

- Consider installing a dark fiber network connecting the town's school buildings. However, after evaluating the price tag and the return on this investment, the Town of Bedford felt this solution is not economically viable at this time.

<u>Key Plans and Recommendations:</u>

- Hire professionals to conduct a broadband analysis and make recommendations about the Town of Bedford's long-term broadband goals. The Town of Bedford has expressed interest in participating in the UNH Cooperative Extension "Community Readiness Initiative" to obtain technical assistance to municipalities on broadband projects.

c) City of Manchester

Current Infrastructure: The City of Manchester has in place the largest municipal-owned broadband infrastructure network in the SNHPC Region, connecting all the city's public buildings and facilities. An extensive Inventory, Analysis, and Improvement for Telecommunications Infrastructure in Manchester, NH was prepared by DynDNS and presented to the Manchester Economic Development Office in October 2006. This report found the City of Manchester has a well-developed telecommunications infrastructure that can accommodate businesses of one employee to thousands. After interviews with multiple carriers, Manchester has plenty of additional capacity for broadband-width consumers. The report found the City of Manchester is a logical place for many telecom companies to locate and recommends that the next generation of city-led projects take one of two approaches:

First is an ad-supported network. This model is still being tried, but does not have many of the same characteristics as subscriber-fee networks. The second model is an integrated public services network combining public safety (police, fire and other emergency services), civic network (for municipal services), and public. As noted in the report, given the number of organizations involved, there are many complexities to overcome. As a replacement for cellular data services, cell companies would also be quick to fight efforts to build city-owned networks. Hotels and other subscriber access fee-based hotspots are also against such efforts.

In conclusion, it was recommended that because the actual benefits of city involvement are fairly limited and most municipalities are not always interested in becoming service providers themselves, it is best left in the hands of commercial entities to supply and provide these networks. Cities can assist by developing initiatives to gain rights of way, fair use, and leverage offices such as the Economic Development Office to attract new service providers to the area. Thus, without a large number of government parties participating, there are few actual reasons to create a municipal-owned service network. In addition, the cost to create city-owned fiber to the home is cost prohibitive.

Future Plans: Manchester's Information Technology Director and staff prepared a grant proposal several years ago to develop a public Wi-Fi program for city residents, but was unable to obtain funding. The IT Director and the Mayor both support bringing this proposal back for reconsideration and implementation. In order to carry out the program, the city will need assistance in finding funding and working with several key internet providers and local businesses to participate in the program at various levels of private/public partnership and program development and implementation.

Basically, the project referred to as CityNet will put public Wi-Fi access points in up to 61 locations throughout the city. The access points will be connected to a single Internet Access point using the city's extensive fiber optic cable infrastructure. The project will be innovative in several ways. First the city will utilize dark fiber that already exists in its 70 miles of fiber optic backbone cable currently installed to connect all the city's agencies. Since the infrastructure already exists, the cost to add Wi-Fi in the various locations will be minimal. The project will seek a public/private partnership for the broadband access and for the network support. The Wi-Fi access will be free to the public and will provide coverage around schools, in commercial areas, and in low-income areas in the inner city and surrounding census tracts.

The project meets many of the requirements of the recent federal Broadband Technology Opportunities Program (BTOP) in the following ways:

1. To improve the availability of broadband service to end-users in NH and to facilitate access to broadband service by low-income, unemployed and otherwise vulnerable populations in order to provide educational and employment opportunities to members of such populations.

   - Each location will offer free Wi-Fi access to the Internet for anyone who wants to connect. This will make the internet access available to all. The spots are spread out all over the city so there will be no more than a few minutes' drive to reach a hot spot. Most of the locations have off-street parking available.

   - Schools will have public Wi-Fi available in and outside of the building that can be used by students for their projects.

   - There will be a concentration of nodes in many of the lowest income areas throughout the city.

2. To stimulate the demand for Broadband, economic growth and job creation.

   - Wi-Fi access will be available in the downtown and the Millyard areas, and the business parks on East Industrial Park Drive, Brown Avenue and the Airport. Having this access makes these areas more attractive to technology-based businesses, visitors, students and others, thereby stimulating business development, job creation and investment.

3. To provide Broadband access to job-creating strategic facilities located within State designated Economic Revitalization Zones, and Renewal Community areas (Neighborhood Revitalization Strategy Areas) designated by the Department of Housing and Urban Development. Providing Wi-Fi access in these areas will stimulate new business development and job creation in neighborhoods that currently suffer from comparatively high poverty rates and unemployment. Providing Wi-Fi will also significantly expand access to historically underserved populations thereby increasing opportunities for education, employment and communication.

d) Town of Deerfield

Current Problems/Needs: As identified by this plan, the Town of Deerfield is currently rated as "underserved" in Broadband access. Recently, the Town of Deerfield and the Technology Coordinator with the Deerfield School District have been negotiating with the primary Internet service provider in Deerfield to expand Internet services throughout the community and provide faster Broadband speeds to the school and all the key public buildings and facilities. This negotiation process has also involved updating the town's cable franchise agreement. As reported by the Technology Director, this process has been a difficult struggle. To obtain help, the town formally joined a larger eleven-town consortium recently formed to retain legal services at reduced group purchasing rates. While progress is being made, the Technology Director reports that the cable environment within the community is rapidly eroding and changes are possible in the near future.

iii. UNH Cooperative Extension Cyberlearning Center – Hillsborough County Complex, Goffstown

The University of NH Cooperative Extension is currently seeking to develop a proposal for the reuse of underutilized structures known as buildings 26 & 27 at the Hillsborough County Complex in Goffstown, NH. A work group comprised of staff from local and regional governments, planning agencies, professionals in construction, alternative energy, distance learning as well as practitioners in the agriculture and natural resources area will be engaged in drafting such a proposal. Said proposal would be delivered to the Hillsborough County Commissioners for their consideration.

In October 2009, Cooperative Extension facilitated a Hillsborough County Design Charrette that recommended for the portion of lands identified as "Conservation/Recreation Opportunities" the following: "the land offers many educational opportunities for demonstration projects and best practices in forest management, agriculture, alternative energy and community gardens. Distance learning and increased public access television were also mentioned". While the buildings proposed for reuse are among the structures within an area identified as *Civic Buildings and Lands*, they are directly adjacent to the Conservation/Recreation area and bisected by the town of Goffstown Rail Trail, perhaps providing enhanced public access.

It is envisioned that a **Cyberlearning Center** at this location would allow Cooperative Extension professionals and partners to develop research and demonstration projects on site and deliverable to audiences both face-to-face and through the most current technologies. It is envisioned too, that such a Center could be a demonstration site for energy-efficient building design and infrastructure technologies.

High-speed broadband capacity is being greatly enhanced in the vicinity of these buildings and new technology including a computer with webcam, microphone and 52" screen has been installed by Cooperative Extension in the County Complex office building. This is enabling Extension and county government to greatly enhance their ability to more economically deliver (through saving in staff travel and time) live video conferencing to audiences of perhaps 40 or more through such software as Microsoft Lync, Google+, Skype, and Cisco Jabber.

Submitted by: Daniel F. Reidy, Community Development Field Specialist

UNH Cooperative Extension/Hillsborough County

Dan.reidy@unh.edu   603-641-6060   Oct. 24, 2013

iv. UNH Cooperative Extension – Community Readiness Program

In 2013, the UNH Cooperative Extension Office initiated a new capacity building/community resources team to research successful community broadband solutions and aggregate them into a NH "broadband solutions funding tool kit". In addition, they are working with the State Broadband Director to form a "Resource Team" to assist communities in assessing their readiness to begin implementation of their broadband plans. The Resource Team for "ready" communities are working to assist three communities in assessing their readiness to begin implementation of a broadband plan and provide assistance with community broadband decision-making.

What type of assistance is available to "ready" communities? The Resource Team are bringing the following to "ready" communities: support for developing a local steering committee; materials on the economic implications of broadband; community needs assessment and determining demand; identifying community assets; financing and funding options; planning and regulation considerations; plan for building community support; action planning and training to the business, municipal, health and education sectors.

How were "ready" communities selected? UNH Cooperative Extension sent a password and link to its *Broadband Readiness Assessment Tool* to communities nominated by their Regional Planning Commission. This online assessment tool was a set of questions designed for communities to assess their capacity and resources for implementing broadband. The Resource Team, based on the results of the Broadband Readiness Assessment Tool, lack of broadband access in the area, and input from RPCs, selected three communities to focus on.

How many "ready" communities were selected? Due to funding limitations, UNH Cooperative Extension only selected three "ready" communities. Communities that completed the readiness assessment but were not selected as one of the three communities for direct assistance will be invited to a workshop, in late 2014, to learn more about the content of "ready" community assistance and lessons learned. They will also have access to the online tool box being developed.

What is the timeframe? Communities nominated for "ready" community assistance were sent the online Broadband Readiness Assessment Tool on November 15, 2013. The assessment was completed on December 6, 2013. Selections were announced on December 20, 2013. Assistance began in early 2014 and will last six to nine months.

Based on broadband needs, existing resources and program involvement, the municipalities of Bedford, Deerfield and Manchester were nominated as "ready" communities by the Southern New Hampshire Planning Commission.

Final Selections: After reviewing the applications of many communities, the NHBMPP selected the following three towns to receive broadband planning assistance in 2014:

Bethlehem
Greenfield
Moultonborough

For more information contact:

> Molly Donovan, Extension Specialist, Community and Economic Development
> 802-5046/Molly.donovan@unh.edu/www.extension.edu

a) Current Status of Cable Franchise Agreements

As identified in Table 30, there are eight communities (the towns of Chester, Deerfield, Goffstown, Hooksett, New Boston, Weare and Windham and the City of Manchester) that have been identified (in bold) as currently or will soon need to renew their Cable Franchise Agreements (CFA). Over the past year and half, the Town of Deerfield has been involved in updating their CFA and is currently participating in a consortium of approximately 11 other municipalities both inside and outside the SNHPC Region that have formed to share in the cost of retaining legal services in navigating the CFA negotiation process.

An additional four communities (the towns of Auburn, Bedford, Candia and Derry) will likewise need to renew their municipal CFAs soon.

Currently about 93 percent of all municipal Cable Franchise Agreements in the SNHPC Region are with Comcast, with the exception of Deerfield as the sole community in a contract with MetroCast (See Table 30). Following Deerfield's example, municipalities within the region could work cooperatively together to enter into an informal or formal inter-municipal agreement to obtain legal services or other additional services at reduced costs. In addition, by working together, municipalities would be able to obtain greater access to and assistance and knowledge in the CFA contract and negotiation process.

Table 30: Current Status of Cable Franchise Agreements

Municipality	Cable Franchisee	Start Date	End Date
Auburn	Comcast	2007	2017
Bedford	Comcast	2003	2018
Candia	Comcast	2008	2018
Chester	Comcast	2003	**2013**
Deerfield	MetroCast	2000	**2013**
Derry	Comcast	2009	2019
Goffstown	Comcast	2001	**2011**
Hooksett	Comcast	2004	**2012**
Londonderry	Comcast	2009	2019
Manchester	Comcast	2000	**2015**
New Boston	Comcast	2003	**2013**
Raymond	Comcast	2012	2022
Weare	Comcast	2008	**2015**
Windham	Comcast	2006	**2013**

Source: www.iwantbroadbandnh.org/cable-franchise-agreements

v. Shadow Duct Regulations

During the meetings of the Broadband Stakeholders Group it was suggested that the City of Boston's Shadow Duct Regulations, or Grant of Location Policy, be considered as a guide for how municipalities in New Hampshire can improve utility installations, including broadband. This particular policy requires broadband utilities to be constructed and/or repaired and buried only during scheduled street reconstruction or resurfacing. According to the language of the policy, the objective is "...to maximize the availability of new conduit networks for the provision of commercial telecommunications services within the City and to minimize multiple street openings and resulting disruption to the public way".[65] Implementation and coordination is conducted by the Public Improvement Commission (PIC), an independent body located in the Boston Public Works Department. By instituting this policy, the city intends to accomplish four functions: "...minimize disruption to the City's public ways, allow the planned development of telecommunications facilities within the City to benefit Boston's economy, provide future Network applicants reasonable and timely access to City streets and facilitate the timely construction of all such Networks."[66] Upon speaking with the PIC Lawyer, Mr. Chong Liu, SNHPC staff learned that the City of Boston views this policy as being very successful, so much so that cities across the country have contacted them to learn more.

---

[65] "Policy Relating to Grants of Location for New Conduit Network for the Provision of Commercial Telecommunications Services". August 4, 1994.
[66] Ibid.

vi. DRED Broadband Programs

To empower communities where broadband service is sub-par, NH DRED has produced "Taking Control of Your Broadband Destiny," a ten-step process that citizens and local officials can take to initiate better broadband service. The information is designed to provide a basic approach to address the community's or neighborhood's broadband needs they are looking to resolve. Residents and communities who may not have been involved in the New Hampshire Broadband Mapping and Planning program are recommended to refer to this list, in addition to the material presented in this regional broadband plan document.[67] DRED staff dedicated to the broadband programs work on behalf of constituents across New Hampshire with regards to complaints, investigations and provides technical assistance for communities with needs related to broadband.

---

[67] http://nheconomy.com/business-services/broadband-telecommunications/10-steps.aspx

F. Findings & Recommendations

1. Evaluation and Prioritization of Needs/Challenges/Opportunities

As discussed in Section E, Challenges to and Opportunities for Regional Broadband Implementation and Improvement, there are many identified needs/challenges as well as opportunities for broadband in the SNHPC Region.

In order of major needs and challenges, the SNHPC Region is confronted with the following broadband issues and problems:

1. The Town of Deerfield is identified as the only community in the region as "underserved" for broadband intensive applications and uses;

2. There are many scattered and isolated geographic pockets or "end of the line" areas and neighborhoods in almost every municipality within the region which lack in one form another moderate to high speed broadband services. Moderate speed is defined as advertised download speeds of 3 to 6 Mbps and upload speeds of 1.5 + Mbps. High speed broadband is defined as advertised download speeds greater than 10Mbps and upload speeds greater than 6 Mbps.

3. Almost all of the region's municipalities, except for the Town of Deerfield and City of Manchester, do not have broadband plans in place – either as part of the local master plan or as part of the town's information technology plan or capital improvement program.

4. There are many low-income households and underrepresented populations, mainly within the City of Manchester, that cannot afford the internet or even the cost of a computer (13.8 percent of all individuals and 10.2 percent of all families in Manchester fall below the poverty level; 48.87 percent of Manchester's 2012 total school enrollment was eligible for free/reduced school lunch).

5. Computers and use of the internet is still a relatively new technology to low-income households and those with English as a secondary language (particularly the large refugee population within the City of Manchester). This presents a large disadvantage to these families and households for economic advancement and employment. According to a recent survey conducted by Comcast, only 20 percent of those living in the inner city of Manchester have internet access at home

6. In a telephone survey of broadband use and cost in the SNHPC Region – approximately 21 percent of the respondents indicated they pay $20-$49/month for the internet; 29 percent indicated they pay $50-$99/month; and 28 percent pay over $100/month. While it is not clear if these prices include bundled services, about 79 percent of the residents currently paying for internet services in the region pay for bundled services. Households earning less than $20,000 are less likely to pay for bundled services.

7. According to the NHBMMP Community Anchor Institutions inventory, most K-12 schools in the region are noted as having broadband available, except for several schools in the towns of

Raymond, Deerfield, Chester and Londonderry. Some medical/health care facilities in the region also do not report having broadband services.

8. Almost all the municipalities in the region, except for the City of Manchester do not have broadband connectivity between municipal buildings, libraries, police and fire, schools and other public facilities – either public or privately owned fiber.

9. There is very limited public funding (grant monies and state and local funding) or resources available to municipalities or property owners to seek and implement broadband infrastructure expansion and improvement.

10. Many of the municipalities and private businesses in the region do not have adequate back up power sources to ensure continued internet access during a blackout or natural disaster. With the trend going away from landlines and more towards wireless communication and smart phones, maintaining communications and internet access is becoming a critical economic and public safety issue during public disasters.

11. The towns of Deerfield and Raymond contain less than 9 ISPs each and Deerfield only has one cable provider.

12. "Make Ready" – making telephone and utility poles ready to accept broadband wire or cable has been a long term problem throughout the state and the region as many poles are owned by the electric and/or telephone companies and obtaining approval to string broadband on these poles can take many months, which is time consuming and expensive for internet service providers and broadband installation companies.

13. Broadband is often not included in local cable franchise agreements and negotiating new agreements and new franchise fees with cable (internet) service providers is often a difficult and time consuming legal process for municipalities and public agencies. Many internet service providers operate have strong lobbying power and interests in limiting competition within their franchise territories.

14. The need for broadband connectivity and infrastructure improvements is often not addressed in local telecommunications regulations and land use policies. In addition, it is often still difficult to site cell towers in many communities.

15. Many municipalities do not have in place local site plan regulations or land use policies that would require, as done in many other parts of the world, new buildings be built with conduit for installation of broadband fiber optics.

16. Many municipalities do not have adequate street utility installation policies and fees in place for burying and leasing public right of way for telecommunications conduit for cable or broadband fiber.

17. Finally, there are a limited number of businesses and free public Wi-Fi hot spots located within the SNHPC Region. Most of the existing hot spots are privately owned restaurants, coffee shops and cafes. About ten years ago the Manchester Chamber of Commerce organized and implemented free Wi-Fi along Elm Street within the downtown center of Manchester. Today however this system is out of date and is not actively used.

In response to these major problems and issues, the following broadband opportunities have been identified within the SNHPC Region through this plan.

1. The Director of Broadband Technologies at the NH Department of Resources and Economic Development (NH DRED) has been working with FairPoint to utilize available funding set aside in response to FairPoint's acquisition of Verizon's internet and telephone business in the state to assist communities identified as unserved or underserved through the NHBMPP. While these funds have now been allocated to specific communities, additional funding may be realized in the future and the Town of Deerfield should continue to monitor this in the future.[68]

2. The Director of Broadband Technologies at NH DRED and UNH have been working together to develop both financial and technical assistance to communities in broadband expansion and infrastructure improvements. New state legislation will allow municipalities to bond for broadband infrastructure projects. Bonding could be an excellent source of funding for communities that wish to actively plan and develop municipal owned broadband infrastructure or to provide for broadband connectivity between municipal buildings, public facilities and schools.

3. Unless a community sets aside broadband funding in their CIP, or property owners work together collaboratively to raise local monies, there are very few grants available to assist in expanding and improving local broadband infrastructure and services in New Hampshire, particularly in addressing many of the region's "end of the line" issues and problems. Currently, the only grant funding sources available municipal broadband improvements are the U.S. Department of Commerce, Economic Development Administration (EDA) grants and the U.S. Department of Agriculture Community Connect Grants.

4. The best opportunity for expanding local broadband services and increasing bandwidth and download and upload speeds is by working directly with the largest ISPs currently operating within the region. This could be more effective as a statewide initative driven by NH DRED and UNH working collaboratively with the ISPs.

5. State and local funding is needed in order to enable and engage municipalities to develop local broadband plans – either as part of the town's master plan or as part of the town's Information Technology (IT) plan or capital improvement program. The SNHPC has utilized some of its NHBMPP funding in working with UNH to develop a model broadband chapter in the Town of

---

[68] The Connect America Fund awarded $895,000 in late 2013 to be spent over a three year time period. Source: Carol Miller, Director of Broadband Technologies, DRED. Personal Correspondence: March 10, 2014.

Deerfield's master plan. The Planning Board in Deerfield has an opportunity to adopt this chapter and utilize it in addressing the town's existing and future broadband needs.

6. There are a number of nonprofit organizations and charities operating within the City of Manchester set up to help enable and provide computer and internet training for many of the city's low income households, families and refugees. Some of these organizations include the Holy Cross Family Learning Center and the International Institute for New England.   Staff at NH DRED, UNH and SNHPC could assist these organizations in seeking grant funding from the NH Charitable Foundation to help maintain the computer labs and internet training provided by these organizations.

7. The UNH Cooperative Extension Office is also currently seeking to develop a proposal for the reuse of underutilized structures at the Hillsborough County Complex in Goffstown for a future Cyberlearning Center. This center would take advantage of high speed broadband capacity currently being developed at this facility to enhance and promote greater and more economically affordable live video conferencing capabilities for both the public and private sectors.

8. Many of the largest ISPs could establish an internet affordability program similar to Comcast's Internet Essentials Program which offers low income households with at least one child eligible to participate in the National School Lunch Program to obtain low-cost broadband service for $9.95 a month plus taxes and an option to purchase an internet-ready computer for under $150. Other ISPs could offer similar broadband adoption and affordability programs not only for low-income households, but also senior citizens, unemployed veterans and students, refugees, handicapped and disabled individuals, and home-based businesses and employees who telecommute as a means not only help many find jobs and advance economically, but also as an economic incentive to reduce vehicle miles and carbon emissions in our cities and towns.

9. While the cost for internet services varies from one ISP to another, achieving lower internet service costs for residents and businesses within the SNHPC Region is a major goal of this plan. The Granite State Future's telephone survey found many households (28 percent of the survey respondents) in the region pay well over $100 month on internet bills. While it is not clear if this includes other bundled services such as phone and TV, the costs for internet services in the region, particularly within the City of Manchester where over 10 percent of all the families in the city fall below the poverty level, are beyond the reach of many residents. A more detailed study is needed to determine how the SNHPC Region and the City of Manchester compares to other similar-sized cities and regions in New England. This information is key for any attempt in working with the ISPs to seek lower costs and more affordable internet programs.

10. The SNHPC and other regional planning commissions in the state can and should continue to work with their communities and local businesses, health, education, safety and other sectors of the economy to update and maintain a more accurate local inventory of community anchor institutions. This database is an important component of the NHBMPP and is used by UNH in

developing Figure 23: Broadband Availability at Community Anchor Institutions in monitoring and promoting greater broadband access and connectivity among public facilities, schools and medical/health centers.

11. This data could also be expanded to indicate if the community anchor institutions have adequate back up power supply or generators to ensure continued internet access during emergencies and natural disasters. The NH DRED, UNH and the NH Department of Safety could work together at a state level to develop an incentive program to utilize and direct available federal homeland security funding to municipalities and to ensure that public libraries, community centers, schools and municipal buildings have protected internet connections and services.

12. The Public Utilities Commission, NH DRED, UNH as well as other appropriate state agencies and the state legislature could work together to improve the "Make Ready" process between ISPs and the public utilities in the state to expedite the permitting time and fees charged for above ground broadband installation and expansion. This would have significant impacts in speeding the delivery of broadband infrastructure and services to many unserved and underserved communities in the state.

13. The UNH Cooperative Extension, UNH staff working on the NHBMPP, and the State Broadband Director are rolling out a new Broadband Community Readiness Program to needy municipalities throughout the state. This program will research both successful community broadband solutions and develop a funding toolkit for municipalities as well as form a "Resource Team" to assist communities in assessing their readiness to begin implementation of broadband plans and provide assistance with community broadband decision-making. Three communities have been already selected within the state. The towns of Bedford and Deerfield and the City of Manchester within the SNHPC Region have expressed interest in participating in this program if it is continued in the future.

14. The Town of Deerfield over the past year and half has participated in a new and innovative group purchasing consortium of ten other municipalities to obtain and pay for legal assistance in negotiating local cable franchise agreements. Some municipalities such as the town of Auburn in the SNHPC Region have been successful in negotiating the establishment of an Informational Technology Grant Fund for the community as part of their cable franchise agreement. This fund is used to help the community in both telecommunications and information technology needs, including broadband and it is in addition to the standard franchise fee communities currently receive. Both the consortium of towns and the IT grant fund offer innovative ideas and solutions for many communities.

15. SNHPC and many of the regional planning commissions in the state can conduct thorough audits of local telecommunications ordinances, cell tower site plan and zoning regulations and other land use policies to identify where broadband can be improved and facilitated within the community through the building and development process. In addition, many communities can

improve upon their utility and street installation procedures and fees to better facilitate the installation of underground broadband fiber and conduits. The shadow duct regulations developed by the City of Boston offer a good model for how cities can regulate and obtain fees for burying conduit which can be used for community-wide broadband applications and infrastructure needs. In addition, many communities could require that conduit be installed in all new construction for broadband fiber optics.

16. Currently the Town of Weare and portions of the Town of Chester have internet services which are powered entirely by fiber optics to the home and workplace. This system was installed and entirely funded by Granite State Telephone for its customer base to provide high speed broadband today and in the future. This broadband infrastructure offers a model for many other service providers in the region and state.

17. Currently, the IT Director with the City of Manchester is seeking funding to develop and implement a highly innovative public/private project to establish a free Wi-Fi Program in the city modeled after the City of Portsmouth's existing program. This program could be expanded to include adjacent municipalities as well. Potentially the city may seek EDA funding to implement the program in the near future.

2. Key Strategies for Addressing Regional Broadband Needs

In evaluating the above identified major issues, challenges and opportunities for broadband improvement and expansion in the region, the BSG has identified a total of nine key strategies and actions. These strategies/actions are also identified in the following implementation matrix of this plan (See Section G. Implementation).

1. Planning Boards and municipal planners need assistance in developing broadband chapters in the town master plans. Regional planning commissions and IT staff as well as UNH and NH OEP staff are well qualified to provide this assistance.

2. Public officials and municipal planners can and should be requested to review and update the Community Anchor Institution data that is collected and submitted for the broadband mapping program. Regional planning commissions as well as UNH and OEP staff can assist.

3. DRED, UNH, OEP, Department of Safety and regional planning commissions should work collaboratively to research and apply for grant funding to establish a program to establish back-up power generators and systems to power and protect local public internet connections.

4. Communities within the SNHPC Region should continue to monitor and seek participation in the UNH Cooperative Extension Broadband Community Readiness Program.

5. Regional Planning Commissions should be available to provide assistance to UNH Cooperative Extension in developing resource toolkits for improving local broadband planning and regulations.

6. The SNHPC should actively support the City of Manchester in future partnerships and grant applications seeking funding to implement a free public Wi-Fi program in the city and possibly surrounding towns.

7. DRED, NH OEP and UNH staff should work together to form a partnership with all the major ISPs in the state to increase broadband width and provide faster broadband speeds in the future.

8. The same entities above should work together to encourage and assist the major ISPs in developing and implementing broadband adoption and affordability programs similar to Comcast's Internet Essentials Program. They should also expand this program to offer reduced internet costs to many of the refugees, homeless, senior citizens, disabled and handicapped residents, students, and unemployed veterans in the Manchester area. In addition, similar programs could be focused on home-based businesses and employees who telecommute.

3. Desired Outcomes & Recommended Targets

Essentially, by following through and implementing these nine key strategies and actions, the vision of this regional broadband plan will be realized and the Southern NH Region and the Greater Manchester area will be considered and fully recognized as a technology-friendly region in the state.

Through this recognition, more advanced and technology-based companies and firms will be attracted to the region; more employment opportunities will be created; and more people, households and individuals will be able to afford and use the internet to seek greater economic advancement and employment.

In addition, it is hoped that many of the region's communities will follow and learn from the examples of the towns of Deerfield and Bedford, and the City of Manchester in seeking to expand local broadband opportunities, infrastructure and connectivity. This plan seeks to offer helpful guidance and resources to make this work happen.

Figure 38: Tower disguised as a tree, Town of Windham

Source: NH OEP

102

G. Implementation

The following **Regional Broadband Implementation Matrix** sets forth the key strategies and actions of this plan. These strategies and actions have been prioritized and assigned a priority ranking of either a high, medium or low priority by the region's Broadband Stakeholders Group (BSG). In addition, a level of action – either primary or secondary – is identified in the matrix by the BSG. The level of action identifies if the strategy or action is focused primarily at a local, region or at the state level or all three.

Along with these priority rankings, the matrix also identifies the relevant public and private sectors (economic, education, government, health, public safety and residential) that the key strategy or action would directly involve or impact. The matrix also identifies the potential partners required in implementation, including the level of commitment that would be needed – e.g. additional funding, level of investment, infrastructure and staff time required. This information is provided under the notes section of the matrix.

It is important to point out from a program standpoint most of the strategies and actions included in this matrix and recommended by the BSG for this plan involve multiple partners in implementation. The Southern New Hampshire Planning Commission is just one entity in the implementation process. Ultimately all the partners identified in the matrix must work together to achieve the recommended strategies and actions.

For planning and programming purposes, the Southern New Hampshire Planning Commission is identified as an important partner in 14 of the 20 total strategies and actions identified in the matrix.

Priority Rating	Phase*	Strategy / Key Action	Level of Action*	Relevant Sectors*						Potential Partners	Notes*
				Economic	Education	Government	Health	Public Safety	Residential		
High	Ongoing	Assist planning boards/municipal planners to develop Broadband Master Plan chapters.	● Local ○ Region	○	○	●	○	●	●	Planning Boards, Municipal Planners, RPCs and IT Staff	Significant Investment and Staff Time Required; Grant Funding Needed
	Ongoing	Request public officials/municipalities to review and update CAI data for broadband mapping.	● Local ● Region ● State		●	●	●	●		IT Staff, Governing Boards, Department Heads and RPCs	Minimal Investment and Staff Time Required
	Ongoing	Research grants/seek funding to assist local governments in establishing back-up power supply systems/generators to power broadband & governmental functions.	○ Local ● Region	○	●	●	●	●	●	ISPs, UNH, DRED, NH OEP, Emergency Management Directors and RPCs	Minimal Staff Time Required; Grant Funding Needed from Homeland Security & NH Dept. of Safety
	Short Term	Assist planning boards/municipal planners to update local site plan regulations to require installation of conduit for fiber optics in new construction.	● Local ○ Region			●				Code Enforcement/ Municipal Planners and Public Works Staff	Minimal Investment and Staff Time Required/Boiler Plate - Template Required
	Short Term	Seek continuation and participation in UNH Cooperative Extension Broadband Community Readiness Program.	● Local ○ Region			●				IT Staff, Governing Boards and Department Heads	Minimal Investment and Staff Time Required
	Short Term	Assist UNH Cooperative Extension in developing resources and a tool kit for municipalities in broadband planning, infrastructure and connectivity.	● Region	○		●		●	○	UNH, DRED, NH OEP, IT Staff and RPCs	Significant Investment and Staff Time Required; Grant Funding Needed
	Medium Term	Assist City of Manchester IT staff to facilitate conversations with industry experts to expand existing and develop new free public Wi-Fi networks in Manchester and surrounding towns.	● Local ○ Region	●	●	●			●	ISPs, IT Staff, RPCs, Economic Development Staff, Local Residents and Stakeholders	Significant Investment, Partnerships and Grant Funding Needed; EDA Funding Possible
	Long Term	Encourage ISPs in region to increase bandwidth and provide faster broadband speeds. Download speeds should > 1 Gbps.	● Local ● Region ● State	●	●	○	●	○	●	UNH, DRED, NH OEP and ISPs	Significant Investment in Infrastructure Required. Statewide incentives needed for ISPs
	Long Term	Encourage ISPs to offer affordable internet services for refugees, homeless and unemployed veterans, home-based businesses, students and employees who telecommute, similar to Comcast Internet Essentials Program.	● Local ● Region ● State	●	○	●			●	ISPs, UNH, DRED, NH OEP and RPCs	Minimal Investment and Staff Time Required

* Matrix Key

Phase		Level of Action	Relevant Sectors	Notes:
Short = < 1 yrs.		● Primary level of action	● Primary Sector Affected	This field can contain information on potential funding sources, fiscal impact (cost neutral, minimal investment, significant investment), and other relevant factors.
Medium = 2-4 yrs.		○ Secondary level of action	○ Secondary Sector(s) Affected	
Long = >4 yrs.				
Ongoing				

Priority Rating	Phase*	Strategy / Key Action	Level of Action*	Relevant Sectors*						Potential Partners	Notes*
				Economic	Education	Government	Health	Public Safety	Residential		
Medium	Ongoing	Seek funding to support computer and internet training of underrepresented populations and refugees in the region to advance in the workplace.	● Local ○ Region		●	●			●	Employment Security and local charity and nonprofit organizations	Moderate Investment and Organization Time Required
	Short Term	Develop / update local public works department policies to include Shadow Duct Regulations for broadband installation.	● Local ● Region			●		●		ISPs, IT, Municipal Planners and Public Works Staff	Minimal Investment and Staff Time Required - City of Manchester Key Focus
	Short Term	Develop a policy manual for how to update Cable Franchise Agreements to include broadband and to negotiate with ISPs.	● Local ● Region ● State	●	●	●	●	●	●	UNH, DRED, NH OEP, ISPs, IT Staff, Attorneys and RPCs	Moderate Investment and Staff Time Required
	Short Term	Assist municipalities in updating Cable Franchise Agreements and encourage participation in cost sharing for legal services.	● Local ● Region		●	●		●		Municipalities, School Boards, IT Staff, Attorneys and RPCs	Minimal Investment and Staff Time Required
	Short Term	Assist municipalities in establishing Impact Fees and Community Technology Funds in local CIPs which can be used for broadband infrastructure.	● Local ● Region			●				UNH, DRED, NH OEP and RPCs	Moderate Investment and Organization Time Required
	Short Term	Support continued funding of NH Broadband Mapping program efforts to collect, analyze and map broadband information in the region.	● Region	○	○	●	○	○	○	ISPs, UNH, DRED, NH OEP and RPCs	Significant Investment and Staff Time Required; Grant Funding Needed
	Long Term	Support programs to help businesses and residential broadband users maintain power during emergencies.	● Local ○ Region	●	○	●	●	●	●	ISPs, UNH, DRED, NH OEP and Power Companies	Emerging Management Issue, Moderate Investment and Staff Time Required

* Matrix Key							
Phase		**Level of Action**		**Relevant Sectors**			**Notes:**
Short = < 1 yrs.		● Primary level of action		● Primary Sector Affected			This field can contain information on potential funding sources, fiscal impact (cost neutral, minimal investment, significant investment), and other relevant factors.
Medium = 2-4 yrs.		○ Secondary level of action		○ Secondary Sector(s) Affected			
Long = >4 yrs.							
Ongoing							

Figure 41: Low Priority Strategies to Implement Broadband

Priority Rating	Phase*	Strategy / Key Action	Level of Action*	Relevant Sectors*						Potential Partners	Notes*
				Economic	Education	Government	Health	Public Safety	Residential		
Low	Short Term	Assist UNH, DRED and OEP in developing guidance materials for communities in developing broadband master plan chapters	● Region	○	○	●	○	○		UNH, DRED, NH OEP and RPCs	Moderate Investment and Organization Time Required
	Short Term	Assist municipalities in conducting local audits of land use regulations and policies to identify barriers to broadband development	● Local ● Region			●				Planning Boards, Municipal Planners, ISPs and RPCs	Minimal Investment and Staff Time Required
	Short Term	Encourage and support fiber infrastructure as priority projects in regional CEDS and other local / regional plans	● Region	○		●				Governing Boards, ISPs, Regional Economic Development Corporations and RPCs	Minimal Investment and Staff Time Required
	Long Term	Utilize existing TAB in exploring opportunities for municipalities to generate funding for broadband	● Local ● Region ● State			●				UNH, DRED, NH OEP and RPCs	Moderate Investment and Staff Time Required

* Matrix Key					
Phase		**Level of Action**	**Relevant Sectors**		**Notes:**
Short = < 1 yrs.		● Primary level of action	● Primary Sector Affected		This field can contain information on potential funding sources, fiscal impact (cost neutral, minimal investment, significant investment), and other relevant factors.
Medium = 2-4 yrs.		○ Secondary level of action	○ Secondary Sector(s) Affected		
Long = >4 yrs.					
Ongoing					

H. Conclusion

Broadband is an important part of the infrastructure for our state, the region and every community within New Hampshire. As the National Broadband Plan (www.broadband.gov) emphasizes, the deployment of improved infrastructure means advances in the areas of health care, economic development and jobs, education, energy and the environment, governmental performance and efficiency, civic engagement and public safety for all citizens of the country. Thus, there is a national effort through many federal, state and local agencies to make it easier to attach new equipment to utility poles, lower the cost of "making the poles ready" for these attachments, reducing the time it takes to review and approve the installation of wireless equipment, and improving policies and procedures to allow the entry of this equipment into publicly owned rights of way.

Figure 42: August 29, 2013 Broadband Stakeholders Group Meeting

Source: SNHPC

New Hampshire is also taking major steps and actions to implement the goals of this national effort. In recent legislative actions, the New Hampshire General Court passed and the Governor signed new laws allowing municipalities to now bond for broadband infrastructure improvements, including changes as to how municipal officials and local planning boards can review new telecommunications proposals to co-locate and modify "personal wireless facilities" (see RSA 12-:2). In addition, the NH Broadband Mapping and Planning Program (NHBMPP) is currently compiling a toolbox to assist communities in improving broadband. This toolbox will include resources related to available broadband funding sources, timeframes and links to obtain detailed information. Also included is information about using fiber and analyzing the cost of installing fiber to the home and commercial buildings. There is a lot to learn and the environment and technology is constantly evolving and improving. Today, high-speed Internet is common in many parts of the SNHPC Region and other parts of the state. Consumers have grown accustomed to fast broadband connections in their homes, workplaces, in airports, cafes, and hotels, on buses and even in waiting rooms at medical centers. But in less populated areas, access to broadband can be spotty. In addition, access can often be too expensive for the poor. For economic advancement, Broadband is essential and can often be the difference between growth and stagnation. The NHBMPP project is helping our region and our communities begin to understand, identify and plan for how we can all better use Broadband to increase efficiency, enhance communications and improve our quality of life. Regional planning commissions have worked hard over the past several years to help establish a base line framework for moving forward into the future.

I. Appendices

Appendix A: Glossary of Terms*[69]

Asymmetrical – For the purposes of broadband technologies, it means that the download speed and upload speed are not the same. The download speed is higher than the upload speed. A common configuration would be 1.544 mbps download speed and 256 kbps upload speed.

Bandwidth – The transmission capacity of an electronic pathway such as a communications line, computer bus or computer channel. In a digital line, it is measured in bits per second or bytes per second (see Mbps). In an analog channel or in a digital channel that is wrapped in a carrier frequency, bandwidth is the difference between the highest and lowest frequencies and is measured in Hertz (KHz, MHz, GHz).

Broadband – (1) High-speed transmission. The term commonly refers to Internet access via cable and DSL, which is as much as 400 times faster than analog dial-up. The term has always referred to a higher-speed connection, but the speed threshold varies with the times. Widely employed in companies, the 1.5 Mbps T1 line was often considered the starting point for broadband speeds, while the FCC defines broadband as a minimum upload speed of 200 Kbps.

The T1 line is no longer the coveted connection for Web surfing. Home users with cable modems experience download speeds up to four times that of T1 and more (see cable modem). For example, in 2007, Comcast offered home users a premium service of 1 Mbps upload and 16 Mbps download. Fiber-based offerings from telephone companies are even greater.

After the turn of the century, South Korea leapfrogged the U.S. in Internet access, offering DSL up to 50 Mbps and calling their 1.5 Mbps service "light." See broadband router, wireless broadband, T1, cable modem and DSL.

(2) Transmitting data by modulating a carrier wave in order to differentiate it from other signals in the air or in a single line. For example, frequency division multiplexing (FDM) is used to carry hundreds of channels of analog and digital TV in a single coaxial cable. In this context, broadband is used in contrast with "baseband," which is data that has not been modulated or multiplexed. In most cases, the term "broadband" is used for high-speed transmission as in definition #1 above.

Cable modem – A modem used to connect a computer to a cable TV service that provides Internet access. Cable modems can dramatically increase the bandwidth between the user's computer and the Internet service provider. Download speeds have reached 6 Mbps and beyond, but the connection is asynchronous. In order to prevent users with lower-cost cable access from hosting high-traffic Web servers, the upload speed is considerably slower, from 10 to 20 times slower. Cable operators also routinely change IP addresses assigned to users to prevent Web hosting.

---

[69] Glossary of Terms supplied by the New Hampshire Broadband Mapping & Planning Program is originally from the 2008 New Hampshire State Broadband Action Plan http://www.nheconomy.com/uploads/Broadband-Action-Plan-Appendices.pdf Accessed March 12, 2014.

Channel – The physical connecting medium in a network, which could be twisted wire pairs, coaxial cable or optical fiber between clients, servers and other devices.

Disaster Recovery Plan – A plan for duplicating computer operations after a catastrophe occurs, such as a fire or earthquake. It includes routine off-site backup as well as a procedure for activating vital information systems in a new location.

DSL (Digital Subscriber Line) – A technology that dramatically increases the digital capacity of ordinary telephone lines (the local loops) into the home or office. DSL speeds are based on the distance between the customer and Telco central office. There are two main categories. Asymmetric DSL (ADSL) is for Internet access, where fast downstream is required, but slow upstream is acceptable. Symmetric DSL (SDSL, HDSL, etc.) is designed for connections that require high speed in both directions.

FCC (Federal Communications Commission) – An independent United States government agency, directly responsible to Congress. The FCC was established by the Communications Act of 1934 and is charged with regulating interstate and international communications by radio, television, wire, satellite and cable. The FCC's jurisdiction covers the 50 states, the District of Columbia, and U.S. possessions. (http://www.fcc.gov/aboutus.html)

FCC Rural Healthcare Pilot Project – The pilot program is an enhanced funding initiative intended to help public and non-profit health care providers construct state- and region-wide broadband networks to provide telehealth and telemedicine services throughout the nation. The program will fund up to 85% of the costs of constructing those networks, as well as the costs of advanced telecommunications and information services that will ride over these networks. If selected, up to 85% of the cost of connecting to Internet2, a dedicated nationwide backbone, may also be funded by the pilot program. Connection to Internet2 is not required, but may be requested by the applicants. (http://www.fcc.gov/cgb/rural/rhcp.html)

Fiber-optic – Refers to systems that use optical fibers. Fiber-optic communications networks have transformed the world. Barely starting in the late 1960s but gaining serious momentum in the 1980s, the phone companies began to replace their copper long distance trunks with fiber cable. Eventually, all transmission systems and networks are expected to become fiber based, even to the home. In time, the electronic circuits in computers may be partially or fully replaced with circuits of light, in which case fiber pathways would be used throughout the system.

Fixed Wireless – Refers to point-to-point transmission through the air between stationary devices. Fixed wireless is typically used for "last mile" connectivity to buildings.

FTP (File Transfer Protocol) – A protocol used to transfer files over a TCP/IP network (Internet, UNIX, etc.). For example, after developing the HTML pages for a Web site on a local machine, they are typically uploaded to the Web server using FTP.

FTP includes functions to log onto the network, list directories and copy files. It can also convert between the ASCII and EBCDIC character codes. FTP operations can be performed by typing commands

at a command prompt or via an FTP utility running under a graphical interface such as Windows. FTP transfers can also be initiated from within a Web browser by entering the URL preceded with ftp://.

Internet2 – The second generation of the Internet, developed by a consortium of more than 200 universities, private companies and the U.S. government. It was not developed for commercial use or to replace the Internet, but is the reincarnation of it, intended primarily for research. Whereas the Internet was first designed to exchange text, Internet2 is designed for full-motion video and 3D animations. Originally named UCAID (University Corporation for Advanced Internet Development), Internet2 spawned the high-speed Abilene backbone.

Kbps – One thousand bits per second. Kbps is used as a rating of relatively slow transmission speed compared to the common Mbps or Gbps ratings.

Last Mile – The connection between the customer and the telephone company, cable company or ISP. The last mile has traditionally used copper-based telephone wire or coaxial cable, but wireless technologies offer alternative options in some locations. Also called "first mile."

Mbps – Mbps means megabits per second and is used for transmission speeds in a network or in internal circuits.

Mobile Wireless – Refers to transmission through the air from a base station to a moving device such as a cell phone.

Cellular vs. Wi-Fi – Cellular carriers offer optional, digital data services for Web browsing, e-mail and other text and data applications. The data service is separate from the carrier's voice plans, often costing considerably more than a basic voice subscription. The cell phones must support the data service, which is also available for laptops and other portable devices with the installation of the appropriate modem.

Wi-Fi networks are available to the public in many cities and municipal areas. Individual venues such as airports and coffee shops also provide service. Typically fee based by the hour or day, some municipalities provide free service.

Location is the key issue in real estate and also the primary concern with wireless systems. For travelers who need ubiquitous connectivity, there are many gaps (white spaces) in Wi-Fi coverage. Although cellular data rates (EDGE, EV-DO, HSPA, etc.) are typically slower than Wi-Fi, cellular carriers offer the most inclusive coverage when traveling, very often equivalent to using a cell phone for voice.

Network – A system that transmits any combination of voice, video and/or data between users. The network includes the network operating system in the client and server machines, the cables connecting them and all supporting hardware in between, such as bridges, routers and switches. In wireless systems, antennas and towers are also part of the network.

Redundancy – Having a secondary peripheral, computer system or network device that takes over when the primary unit fails.

Remote access – The ability to log on to a computer or network within an organization from an external location. Remote access is typically accomplished by directly dialing up analog or ISDN modems or via a connection to the Internet.

Router – A network device that forwards packets from one network to another. Based on internal routing tables, routers read each incoming packet and decide how to forward it. The destination address in the packets determines which interface on the router outgoing packets are directed to. In large-scale enterprise routers, the current traffic load, congestion, line costs and other factors determine which outgoing line to forward to.

Satellite Broadband – Just as satellites orbiting the earth provide necessary links for telephone and television service, they can also provide links for broadband. Satellite broadband is another form of wireless broadband, also useful for serving remote or sparsely populated areas.

Downstream and upstream speeds for satellite broadband depend on several factors, including the provider and service package purchased, the consumer's line of sight to the orbiting satellite, and the weather. Typically a consumer can expect to receive (download) at a speed of about 500 Kbps and send (upload) at a speed of about 80 Kbps. These speeds may be slower than DSL and cable modem, but download speed is about 10 times faster than download speed with dial-up Internet access. Service can be disrupted in extreme weather conditions. (http://www.fcc.gov/cgb/broadband.html)

Server – A computer system in a network that is shared by multiple users. Servers come in all sizes from x86-based PCs to IBM mainframes. A server may have a keyboard, monitor and mouse directly attached, or one keyboard, monitor and mouse may connect to any number of servers via a switch. In large companies, servers often reside in racks in the datacenter, and all access is via their network connections.

SLA (Service Level Agreement) – A contract between the provider and the user who specifies the level of service that is expected during its term. SLAs are used by vendors and customers as well as internally by IT shops and their end users. They can specify bandwidth availability, response times for routine and ad hoc queries, response time for problem resolution (network down, machine failure, etc.) as well as attitudes and consideration of the technical staff.

Symmetrical – For the purposes of broadband technologies, it means that the download speed and upload speed are the same.

T1 – A 1.544 Mbps point-to-point dedicated, digital circuit provided by the telephone companies. The monthly cost is typically based on distance. T1 lines are widely used for private networks as well as interconnections between an organization's PBX or LAN and the Telco. The first T1 line was tariffed by AT&T in January 1983. However, starting in the early 1960s, T1 was deployed in intercity trunks by AT&T to improve signal quality and make more efficient use of the network.

TCP/IP (Transmission Control Protocol/Internet Protocol) – A communications protocol developed under contract from the U.S. Department of Defense to internetwork dissimilar systems. Invented by

Vinton Cerf and Bob Kahn, this de facto UNIX standard is the protocol of the Internet and the global standard for communications.

Telecommuting – Working at home and communicating with the office by phone, fax and computer. In the U.S., at the beginning of the 21st century, more than 30 million Americans were telecommuting at least one day a week. Also called "teleworking."

Telehealth – Telehealth and telemedicine are sometimes used interchangeably, however, telehealth is generally considered to be a broader and provider neutral term that encompasses various applications where technology and medicine are being utilized to provider better patient care.

Telemedicine – Using a videoconferencing link to a large medical center in order that rural health care facilities can perform diagnosis and treatment. A specialist can monitor the patient remotely taking cues from the general practitioner or nurse who is actually examining the patient. Also referred to as "long distance" medicine.

USAC (Universal Service Administrative Company) – An independent, not-for-profit corporation designated as the administrator of the federal Universal Service Fund by the Federal Communications Commission (FCC). USAC administers Universal Service Fund (USF) programs for high cost companies serving rural areas, low-income consumers, rural health care providers, and schools and libraries. The Universal Service Fund helps provide communities across the country with affordable telecommunications services. (http://www.usac.org/about/usac/)

USF (Universal Service Fund) – The goals of the Universal Service, as mandated by the Telecommunications Act of 1996, are:

♦ To promote the availability of quality services at just, reasonable, and affordable rates

♦ To increase access to advanced telecommunications services throughout the Nation

♦ To advance the ability of such services to all consumers, including those in low income, rural, insular, and high cost areas at rates that are reasonably comparable to those charged in urban areas

The Universal Service Fund (USF) was created by the Federal Communications Commission in 1997 to meet these goals. In addition, the 1996 Act states that all providers of telecommunications services should contribute to federal universal service in some equitable and nondiscriminatory manner; there should be specific, predictable, and sufficient Federal and State mechanisms to preserve and advance universal service; all schools, classrooms, health care providers, and libraries should, generally, have access to advanced telecommunications services; and finally, that the Federal-State Joint Board and the FCC should determine those other principles that, consistent with the 1996 Act, are necessary to protect the public interest. (http://www.usac.org/about/universal-service/purpose-of-fund/)

Video Conferencing – A real time video session between two or more users or between two or more locations. Although the first videoconferencing was done with traditional analog TV and satellites, in-house room systems became popular in the early 1980s after Compression Labs pioneered digitized

video systems that were highly compressed. While videoconferencing may comprise any number of end points communicating, the term "video chat" typically means between two end points only.

VoIP (Voice Over IP) – A telephone service that uses the Internet as a global telephone network. Many companies, including Vonage, 8x8 and AT&T (CallVantage), typically offer calling within the country for a fixed fee and a low per-minute charge for international. Broadband Internet access (cable or DSL) is required, and regular house phones plug into an analog telephone adapter (ATA) provided by the company or purchased from a third party.

VPN (Virtual Private Network) – A private network that is configured within a public network (a carrier's network or the Internet) in order to take advantage of the economies of scale and management facilities of large networks. VPNs are widely used by enterprises to create wide area networks (WANs) that span large geographic areas, to provide site-to-site connections to branch offices and to allow mobile users to dial up their company LANs.

WAN (Wide Area Network) – A long-distance communications network that covers a wide geographic area, such as a state or country. The telephone companies and cellular carriers deploy WANs to service large regional areas or the entire nation. Large enterprises have their own private WANs to link remote offices, or they use the Internet for connectivity. Of course, the Internet is the world's largest WAN.

Wi-Fi (Wireless-FIdelity) – Network devices comply with the IEEE 802.11 wireless Ethernet standards. In the early 2000s, Wi-Fi/802.11 became widely used (initially 802.11b, then 802.11g), and within a short time, all laptops and other handheld devices came with Wi-Fi built in. Earlier laptops can be Wi-Fi enabled by plugging in a Wi-Fi adapter via the USB port or PC Card.

WiMAX (World Interoperability for Microwave Access, Inc.) – An organization founded in 2001 that promotes the IEEE 802.16 wireless broadband standard and provides certification for devices for compliant devices. WiMAX is designed to extend local Wi-Fi networks across greater distances such as a campus, as well as to provide last mile connectivity to an ISP or other carrier many miles away. In addition, Mobile WiMAX offers a voice and higher-speed data alternative to the cellular networks. (www.wimaxforum.org)

Appendix B: Broadband Technology Primer*

(*Content to be provided by NH Broadband Mapping & Planning Program)

Appendix C: UNH-CE Broadband Training Module*

(*Content to be provided by NH Broadband Mapping & Planning Program)

Appendix D: Mapping Protocol*[70]

Introduction

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

Broadband Availability

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

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

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

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

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

---

[70] Prepared by the New Hampshire Broadband Mapping & Planning Program, September 2013.

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

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

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

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

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

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

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

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

Where any of these verification methods indicates that service may not be available in an area reported as served, that area is marked for additional inquiry. Direct contact with the appropriate provider is made to confirm that the mapped data are correct based on project standards. If the finding is that the block is appropriately mapped but there are interior service gaps, the census block (or road segment) is flagged as being partially served. In some cases, broadband service to NH residents was offered or improved based on these reports and direct provider feedback.

Community Anchor Institutions

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

Data Management

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

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

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

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

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

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

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

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

The Future of Mapping Broadband in NH

At the conclusion of the NTIA-funded program in 2014, responsibility for national broadband availability mapping will transfer to the Federal Communications Commission (FCC). Currently, there is a federal requirement for providers to submit to the FCC their service information at the US Census tract level.

Starting in 2015, the FCC requirement will change to reflect the US Census block level geography that has been used by the NHBMPP and its counterparts around the country.

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

Category	Download Speed	Upload Speed	Typical Functions/Use (functions additive to level above)
Unserved	< 768 Kbps	< 200 Kbps	• Email (Client/Server-based; POP)
Underserved	768 Kbps to < 1.5 Mbps	200 Kbps to < 768 Kbps	• Web-based email • Limited web browsing and shopping • Minimal social media use • Sending/Receiving small documents/files (photos, word processing, invoices) but not concerned with speed of download/upload • Not interested in streaming content • No VPN needed for business applications • Use of internet not integrated in daily life function • Single user internet device • Don't require multiple functions to be running simultaneously (e.g. web browsing, streaming video/music, downloading content)
	1.5 Mbps to < 3 Mbps	768 Kbps to <1.5 Mbps	• Web browsing and shopping • Medium social media use • Sending/Receiving medium-sized documents/files (photos, word processing) • Limited streaming content; buffering a concern Standard Definition (SD) content • VPN access possible, but speed of operation not critical to job function • Internet integrated in daily life, and "always" connected • 1-3 simultaneous internet devices possible • Multiple functions working simultaneously possible (e.g. web browsing, streaming video/music, downloading content) but not concerned with potential slowness of downloads and uploads • VoIP (Voice over IP, i.e. telephone over the Internet)

Served	**3 Mbps to <6 Mbps**	**1.5 Mbps to <3 Mbps**	• Medium to high social media use • Sending/Receiving medium to large-sized documents or files (photos, word processing) • Streaming SD content; buffering not a concern; downloading High Definition (HD) content (movies, video) speed a concern • 3-5 internet devices possible • VPN access needed, speed of operation important but not critical to job function • Multiple functions performing simultaneously required (e.g. web browsing, streaming video/music, downloading content), but not concerned with potential slowness of downloads • Low quality, small window frame videoconferencing (Skype) • Cloud-based computing and data storage
	6 Mbps to <10 Mbps	**3 Mbps to 6 Mbps**	• Heavy social media use • Sending/Receiving large documents or files (photos, word processing, small videos) • Streaming HD content (movies, video); buffering not a concern • 5+ internet devices possible • VPN access needed, speed of operation critical to job junction • Higher quality, codec-based videoconferencing • Multi-player online gaming
	10 Mbps to <25 Mbps	**6 Mbps to <10 Mbps**	• Sending/Receiving large files and small to medium-sized databases • HD quality, codec-based, large frame videoconferencing; multiple (bridged) sites/users • Remote synchronous education, professional development, workshops, etc., facilitated simultaneously at multiple classrooms and/or other locations • Telehealth/telemedicine applications possible
	25+ Mbps	**10+ Mbps**	• Sending/Receiving medium to large-sized databases • HD quality, codec-based, large frame videoconferencing (Telepresence) connecting multiple (bridged) sites/users • High speed end to end network and business to business applications • Telemetry-based applications (rely critically on the ability of broadband to continuously monitor and multiplex data, i.e. remote patient monitoring, sensing systems, etc.) • Real-time HD medical imaging and consultation (remote dermatology, etc.) • "Internet2" connectivity and applications

Appendix E: Broadband Grant Calendar Spreadsheet

Organization	Grant/Loans	Timeframe/deadline	Available Funding	Rules	Frequency	Who is Eligible	Web Address for Information
Community Connects Grants USDA	(RUS) Library Development Grant	Applications for the 2013 Fiscal Year are currently being accepted. All applications must be submitted to RUS by May 3, 2013.	50,000 to 1.5 million	Each project requires matching contributions (15%) must serve a rural area where broadband service does not exist, and must offer basic service to all premises within proposed service area. And Applicants must provide broadband for two years to libraries and other community facilities free of charge.	Annually	Eligible for funding:: Incorporated Organizations Indian Tribes or Tribal Organizations, State or local units of government, or Cooperative, private corporations or limited liability companies, organized on a for-profit or not-for-profit basis Eligible areas include: A single community with a population less than 20,000 which does not have Broadband	http://www.rurdev.usda.gov/utp_commconnect.html
Community Development Finance Authority	The Community Development Block Grant program offers funding:	Economic Development Funding On-Going	4,000,000	Must Apply Online at the website for any grants	On-going yearly	Grantee: Municipal sponsors of the project. Sub-recipient: An Economic Development Entity Business: the entity which will create the jobs.	www.nhcdfa.org
EDA	Funding	Dec.15 Cycle 1 March 10 Cycle 2 June.10 Cycle 3 September.15 Funding for Cycle 1 of FY 2013	Generally, the amount of the grant May not exceed 50% total cost of project, but an additional amount shall not exceed 30% based on the relative needs of the region in which the project will be located.		Yearly		http://www.eda.gov/InvestmentsGrants/Investments.xml
Ethyl Grant Program	Grant	Ongoing Basis	Grants allocated at 500-2,500 with a Potential of 5000 for a community and a 10,000 estimated funding a year	Nationwide must be OPASTCO member telephone companies	Every six months applications can be submitted	OPASTCO member telephone companies that are involved with projects aimed at bettering schools and communities.	http://www.fred.org/ethyl

Farm Bill Broadband Program (USDA)	Loans		Low Cost Loans	See Folder For All Rules And Regulations For This Loan Process.	Limited Time	Finance the construction, improvement, and acquisition of all facilities required to provide service at the broadband lending speed in eligible rural areas, including facilities required for providing other services over the same facilities; Finance the cost of leasing facilities. Finance the acquisition of facilities, portions of an existing system; Refinance an outstanding obligation on another telecommunications loan, Finance pre-loan expenses,	http://www.rurdev.usda.gov/utp_farmbill.html
Foundation For Rural Education and Development	Technology Grants For Rural Schools	September 16,2011	1,000 - 5,000	Telephone companies can only submit four applications for schools. Must be OPASTCO member.	Once a year	Schools K-12 Public	http://www.fred.org/
Lowes ToolBox For Education	Grant Program	Spring and Fall yearly	5000	Basic One Time Project Needs	Twice yearly	Grassroots community and school projects in communities where Lowes does business	http://www.toolboxforeducation.com
Mascoma Savings Bank	Grants	Deadline is April 1 and October 1 each year.	Up to 7500 and rarely larger amounts	Nonprofit organizations which will help fund activities that strengthen these communities organizations as they pursue their mission and to help initiate projects that improve life within the Banks MSB Foundation Map	They will not allow the same organization a grant every year	Not For Profit Organizations 501©(3)	http://www.mascomabank.com/foundation
NH Business Finance Authority	Loans (LDO)	All the time	$0- 1,000,000	Secondary Market For Loans Program	Constant	Any Local Development Organization including Municipalities	www.nhbfa.com/ldo_main.html
NH Charitable Foundation	Express Grants	Express March 1/2013 and then Sept 1/2013	5000 and under		Every day of the year		http://www.nhcf.org/page.aspx?pid=606
NH Charitable Foundation	Community Impact Grants	Community Impact proposals April 1,2013 and Sept 30,2013	Over 5000 to 20,000 regions and 25,000 statewide				http://www.nhcf.org/page.aspx?pid=606
NH Charitable Foundation	Express Grants	April 29,2013	5000 and under	Manchester Region Only	Annually		http://www.nhcf.org/page.aspx?pid=606
NH Charitable	Community	June 1,2013	Over 5000 to 20,000 regions and 25,000	Manchester Region Only	Annually		http://www.nhcf.org/page.aspx

Foundation	Impact Grants		statewide				?pid=606
Northern Border Regional Commission Grant	Grant	End Of August this year 2013	30 million to be disbursed from 2008-2012	Transportation and basic infrastructure, job skills training and entrepreneurial development, comprehensive strategy development, advanced technologies and telecommunications, and sustainable energy solutions		States covered for this NY-VT-NH-ME	www.nado.org
PSNH	Community Development Grants	Funding is based on a yearly guideline	150,000	The project is a product of a municipal, government and/or non-profit organization. The project is an investment in economic development. The project will enhance economic activity. The impact will be in PSNH service territory. The project will create or retain jobs. The project will ultimately result in increased or retained electric sales	Yearly	Municipal, Government or Non-profit projects and organizations that have a direct positive impact on the economic development of NH communities	http://www.psnh.com/Environment/Grant-Programs.aspx
State Farm Insurance®	Safety Grants	January 2 thru October 31 yearly			One proposal per organization per year	Auto and Roadway Safety Home Safety and Fire Prevention Disaster Preparedness Disaster Recovery Personal Financial Safety/Security Nonprofit, Tax-exempt 501(c)(3) Charitable Organization Safety Application Educational Institution or Government Entities Safety Application	http://www.statefarm.com/aboutus/community/grants/grants.asp
State Farm Insurance®	Community Development Grants	January 2 thru October 31 yearly			One proposal per organization per year	Affordable Housing 1st Time Homeowners Community Revitalization Economic Development Nonprofit, Tax-exempt 501(c)(3) Charitable Organization Community Development Application Educational Institution or Government Entities	http://www.statefarm.com/aboutus/community/grants/grants.asp

						Community Development Application	
State Farm Insurance®	Educational Grants	January 2 thru October 31 yearly			One proposal per organization per year	We fund three types of grants for K-12 public schools: Teacher Development, Service-Learning and Systemic Improvement. Teacher Development application for nonprofit, tax-exempt 501(c)(3) charitable organization Teacher Development application for educational institution or government entity Service-Learning application for nonprofit, tax-exempt 501(c)(3) charitable organization Service-Learning application for educational institution or government entity Systemic Improvement application for nonprofit, tax-exempt 501(c)(3) charitable organization Systemic Improvement application for educational institution or government entity	http://www.statefarm.com/aboutus/community/grants/grants.asp
State Farm Insurance®	Other Small Grants	January 2 thru October 31 yearly		Arts and Culture Business Groups & Associations Civic Environment Health and Wellness Other Education Other Safety	One proposal per organization per year	Nonprofit, Tax-exempt 501(c)(3) Charitable Organization Application Educational Institution or Government Entities Application	http://www.statefarm.com/aboutus/community/grants/grants.asp
Telecom Infrastructure Loans	Loans	Applications are accepted year round.	Cost-of-Money loans Guaranteed loans, Hardship loans	Loan funds may be used to finance telecommunications services in rural areas for: New construction; Improvements; Expansions; Acquisitions (some restrictions apply–cost of acquisition must be incidental to cost of improvements in loan); Refinancing (some restrictions apply–amount refinanced cannot exceed 40 percent of loan amount).	Yearly	Rural utilities; municipalities; commercial corporations; limited liability companies; public utility districts; Indian tribes; and cooperative, nonprofit, limited-dividend, or mutual associations.	http://www.rurdev.usda.gov/utp_infrastructure.html

Tillotson Fund	Neil and Louise Funding	By 5pm April 1,2013 or October 1, 2013	Up to 20,000 or 20,000 to 100,000	For Economic Development Basic Needs Community Safety. Strengthen regional infrastructure and small business owners and increase public use of regions rich natural culture and recreations resources	Annually	Programs from Colebrook, Pittsburg, Clarksville, Stewartstown, Dixville and other towns in Coo's County	http://www.nhcf.org/page.aspx?pid=606
USDA	(RBEG) PROGRAM	To apply for funding for the RBEG program, please contact your Rural Development State Office.	No maximum level of grant funding. Smaller projects are given higher priority. Generally grants range $10,000 - $500,000.	At least 51 percent of the outstanding interest in any project must have membership or be owned by U.S. citizens or resident aliens.	Each year, Congress provides program funding as called for in the Federal Budget. Fiscal Year funding levels will be made available as soon as possible after the beginning of each Fiscal Year.	Rural public entities (towns, communities, State agencies, and authorities), Indian tribes and rural private non-profit corporations are eligible to apply for funding.	http://www.rurdev.usda.gov/rbs/busp/rbeg.htm
USDA	Predevelopment Planning Grants	Anytime	State Directors are authorized to make PPG up to $15,000 or 75 percent of the project costs, whichever is less.	Funding for the balance of the eligible project costs not funded by the PPG must be from applicant resources or funds from other sources. PPG funds advanced will be considered when calculating the amount of loan and grant funding needed, and will be subtracted from the total grant eligibility, if the Agency provides additional funds for a portion of the project. PPG funds cannot be used to pay for work already completed. If the Agency does not provided additional funds for any portion of the project, the grant will not require repayment.	There is no set time frame for these specific grants.	The applicant must meet eligibility requirements of Part 1780.7 of RUS Instruction 1780. The median household income of the proposed area to be served by the project must be either below the poverty line or below 80 percent of the statewide non-metropolitan median household income. Applicant must provide financial information to document that they do not have the resources to pay predevelopment expenses on their own. .	http://www.rurdev.usda.gov/UWP-predevelopment.htm

USDA	Rural Business Opportunity Grants (RBOG)	Anytime	The amount of funding for the program can vary from year to year. March 29, 2010 reads Total Funding $2.48 million.	The types of projects that may be funded might include identification/ analysis of business opportunities that will utilize local material and human resources; provision of leadership development training to existing or prospective rural entrepreneurs and managers; business support centers; centers for training, technology and export trade; and, economic development planning	Yearly	Rural public bodies, rural nonprofit corporations, rural Indian tribes, and cooperatives with primarily rural members that conduct activities for the mutual benefit of the membership are eligible provided they have sufficient financial strength and expertise to carry out the activity to be funded	http://www.rurdev.usda.gov/BCP_RBOG.html
USDA	DLT Program Grants	Anytime	Awards can range from $50,000 to $500,000.	Acquisition of eligible capital assets: Interactive video equipment Audio and video equipment Terminal equipment Data terminal equipment Inside wiring Computer hardware and software Computer network components Other facilities that further DLT services Acquisition of instructional programming that is a capital asset Acquisition of technical assistance and instruction for using eligible equipment Additional Purposes Eligible for 100% Loans Project operating costs for the first two years Distance learning broadcasting	Applications are accepted annually, after the National Office publishes a Notice of Funds Availability (NOFA) in the Federal Register when funding has been approved by Congress and signed into law by the President. Grants will be awarded on a competitive basis. There is no requirement for matching funds in this program	Entities providing education and medical care via telecommunications including corporations or partnerships, Indian tribes or tribal organizations, state or local units of government, consortia, and private for-profit or not-for profit corporations. Individuals are not eligible.	http://www.rurdev.usda.gov/UTP_DLT.html

| USDA | Public Television Digital Transition Grants | Annually | The amount available for grants for FY 2010 is $4.5 million. The maximum amount for grants under this program is $750,000 per public television station per year. | Grant funds may be used to acquire, lease, and/or install facilities and software necessary to the digital transition, including: Digital transmitters, translators, and repeaters, including all facilities required to initiate DTV broadcasting. Power upgrades of existing DTV equipment, including replacement of low-power digital transmitters with digital transmitters capable of delivering the final authorized power level. Studio-to-transmitter links Equipment to allow local control over digital content and programming, including: Master control equipment Digital program production equipment, including cameras, editing, mixing and storage equipment Multicasting and datacasting equipment Cost of the lease of facilities, if any, for up to three years Associated engineering and environmental studies necessary to Implementation | Annually | Public television stations which serve rural areas. A public television station is a non-commercial educational television broadcast station that is qualified for Community Service Grants by the Corporation of Public Broadcasting under section 396(k) of the Communications Act of 1934. Individuals are not eligible for this program. Grants are not renewable. | http://www.rurdev.usda.gov/UTP_DTV.html |

USDA	Rural Community Development Initiative Grants (RCDI)			Rural Community Development Initiative grants may be used for but are not limited to (a) training sub-grantees to conduct a program on home-ownership education; (b) training sub-grantees to conduct a program for minority business entrepreneurs; (c) providing technical assistance to sub-grantees on how to effectively prepare a strategic plan; (d) provide technical assistance to sub-grantees on how to access alternative funding sources; (e) building organizational capacity through board training; (f) developing training tools, such as videos, workbooks, and reference guides to be used by the sub-grantee; (g) providing technical assistance and training on how to develop successful child care facilities; and (h) providing training on effective fundraising techniques.		To develop the capacity and ability of private, nonprofit community-based housing and community development organizations, and low income rural communities to improve housing, community facilities, community and economic development projects in rural areas.	http://www.rurdev.usda.gov/HAD-RCDI_Grants.html
USDA	Community Facility Grants		The amount of grant assistance for project costs depends upon the median household income and the population in the community where the project is located and the availability of grant funds. In most instances, projects which receive grant assistance have a high priority and are highly leveraged with other	Projects will be selected based on a priority point system. Projects that will receive priority are those that: Serve small communities - with the highest priority going to projects located in a community with a population of 5,000 or less. Serve low-income communities with the highest priority going to projects serving communities with median household incomes below the higher of the poverty line or 60% of the State non-		Grant funds may be used to assist in the development of essential community facilities. Grant funds can be used to construct, enlarge, or improve community facilities for health care, public safety, and community and public services. This can include the purchase of equipment required for a facility's operation. A grant may be made in combination with other CF financial assistance such as a direct or guaranteed loan, applicant contributions, or loans and grants from other sources.	http://www.rurdev.usda.gov/HAD-CF_Grants.html

			loan and grant awards. Grant assistance may be available for up to 75% of project costs. Grant funding limitations are based on population and income, economic feasibility, and availability of funds.	metropolitan median household income. Provide healthcare, public safety, or public and community services			
Verizon Foundation Funding	Funding	January 1st through the last business day of September	Grant requests of $10,000 or more are required to include a project budget breakdown,	Increase their literacy and educational achievement. Avoid being an abuser or a victim of domestic violence. Achieve and sustain their health and safety.	They accept proposals January 1 thru Sept 30 each year.	170(B)(1)(a)(ii) - School* 170(B)(1)(a)(iii) - Hospital or medical research organization 170(B)(1)(a)(iv) - Organization which operates for benefit of college or university and is owned or operated by a governmental unit. 170(B)(1)(a)(v) - Governmental unit 170(B)(1)(a)(vi) - Organization which receives a substantial part of its support from a governmental unit or the general public 509(A)(2) - Organization that normally receives no more than one-third of its support from gross investment income and unrelated business income and at the same time more than one-third of its support from contributions, fees, and gross receipts related to exempt purposes. 509(A)(3) - Organizations operated solely for the benefit of and in conjunction with organizations described in the previous seven items. eligible tax-exempt organizations in certain 501(c)(3) subsections	http://foundation.verizon.com/grant/guidelines.shtml

Source: Director of Broadband Technologies, NH DRED (03/2014)

Appendix F: Sector Focus Group Survey Summary

Appendix G: Free/Reduced School Lunch by Individual School

Table 31: Free/Reduced School Lunch Eligibility by Individual School

District Name	School Name	Enrollment as of 10/1/2012[71]	Free/Reduced Eligible[72]	% Eligible
Auburn	Auburn Village School	558	81	14.52%
Bedford	Peter Woodbury School	444	20	4.50%
	Riddle Brook School	480	20	4.17%
	Memorial School	336	33	9.82%
	McKelvie Intermediate School	767	37	4.82%
	Ross A. Lurgio Middle School	763	41	5.37%
	Bedford High School	1,328	54	4.07%
Candia	Henry W. Moore School	370	69	18.65%
Chester	Chester Academy	517	59	11.41%
Deerfield	Deerfield Community School	384	58	15.10%
Derry Cooperative	Derry Village School	399	113	28.32%
	East Derry Memorial Elementary School	359	57	15.88%
	Ernest P. Barka Elementary School	515	132	25.63%
	Grinnell School	323	146	45.20%
	South Range Elementary School	333	80	24.02%
	Gilbert H. Hood Middle School	721	219	30.37%
	West Running Brook Middle School	552	135	24.46%
Goffstown	Bartlett Elementary School	196	65	33.16%
	Maple Avenue School	455	73	16.04%
	Mountain View Middle School	870	141	16.21%
	Goffstown High School	1,169	147	12.57%
Hooksett	Fred C. Underhill School	318	58	18.24%
	Hooksett Memorial School	487	92	18.89%
	David R. Cawley Middle School	479	88	18.37%
Londonderry	Matthew Thornton Elementary School	565	55	9.73%
	North Londonderry Elementary School	473	42	8.88%
	South Londonderry Elementary School	511	103	20.16%
	Londonderry Middle School	1,089	119	10.93%
	Londonderry Senior High School	1,663	151	9.08%
Manchester	Bakersville School	247	197	79.76%
	Beech Street School	472	442	93.64%
	Gossler Park School	330	255	77.27%
	Green Acres School	514	103	20.04%
	Hallsville School	260	149	57.31%
	Highland-Goffes Falls School	432	165	38.19%
	Jewett School	307	142	46.25%
	McDonough School	458	337	73.58%
	Northwest Elementary School	537	298	55.49%

---

[71] Enrollment adjusted to include children in grades 1 through 12.

[72] Free/Reduced Lunch Eligible count collected as of October 31, 2012. The count is adjusted to include children in grades 1 through 12 only. Count includes free milk eligible program.

	Parker-Varney School	361	223	61.77%
	Smyth Road School	326	80	24.54%
	Webster School	398	156	39.20%
	Weston School	482	194	40.25%
	Wilson School	345	299	86.67%
	Henry J. McLaughlin Middle School	800	412	51.50%
	Hillside Middle School	810	372	45.93%
	Middle School At Parkside	684	443	64.77%
	Southside Middle School	779	425	54.56%
	Manchester Central High School	2,126	790	37.16%
	Manchester Memorial High School	1,849	663	35.86%
	Manchester School of Technology	85	47	55.29%
	Manchester West High School	1,192	549	46.06%
New Boston	New Boston Central School	473	50	10.57%
Raymond	Lamprey River Elementary School	429	131	30.54%
	Iber Holmes Gove Middle School	434	142	32.72%
	Raymond High School	445	120	26.97%
Weare	Center Woods School	452	77	17.04%
	Weare Middle School	466	111	23.82%
Windham	Golden Brook Elementary School	577	28	4.85%
	Windham Center School	619	35	5.65%
	Windham Middle School	644	38	5.90%
	Windham High School	745	27	3.62%
Regional Average	Grades 1-12	36,502	9,988	27.36%
State Average[73]	Grades 1-12	171,180	46,659	27.26%
	Grades 1-8	111,661	32,689	29.28%
	Grades 9-12	59,519	13,970	23.47%

Source: New Hampshire Department of Education

---

[73] State and Regional Averages do not include Charter Schools.

Appendix H: Municipal Cable Franchise Agreement Information

Municipality	Franchisee Name	Start Date	End Date	Duration of Agreement	Number of Public Drops	Dropline Charges for Public Buildings	Dropline Cost Distance for Public Buildings	Length of Dropline for Public Buildings	Number of Reserved PEG Channels	Transmission Quality Guarantee	Number of Upstream Feeds	Inter-Connectivity	Standby Power Duration	Cable Extent Requirements	Dropline Charge for Private Customers	Additional Funding for Operating Support	Terms of the Annual Franchisee Fee Paid to the Town
Auburn	Comcast	2007	2017	10	4	No	0	0	1	Yes	0	Unknown	0	30	Yes	No	3
Bedford	Comcast	2003	2018	15	11	No	0	0	3	Yes	5	Unknown	0	30	Yes	Yes	4
Candia	Comcast	2008	2018	10	5	No	0	0	1	Yes	0	Unknown	0	20	Yes	No	3
Chester	Comcast	2003	2013	10	9	No	0	0	3	Yes	3	Yes	0	0	Yes	Yes	1
Deerfield	MetroCast	2000	2013	13	8	No	0	0	3	Yes	4	Yes	4	0	Yes	Yes	3
Derry	Comcast	2009	2019	10	21	No	0	0	3	Yes	7	Unknown	48	30	Yes	Yes	3
Goffstown	Comcast	2001	2011	10	19	No	0	0	3	Yes	3	Unknown	0	0	Yes	Yes	5
Hooksett	Comcast	2004	2012	8	9	No	0	0	1	No	0	Unknown	0	30	Yes	No	3
Londonderry	Comcast	2009	2019	10	15	No	0	0	6	Yes	11	Unknown	0	20	Yes	Yes	5
Manchester	Comcast	2000	2015	15	67	No	0	0	5	Yes	6	Unknown	0	0	Yes	Yes	5
New Boston	Comcast	2003	2013	10	8	No	0	0	0	Yes	0	Unknown	0	0	Yes	No	3
Raymond	Comcast	2012	2022	10	9	No	0	0	3	Yes	6	Unknown	0	10	Yes	Yes	2
Weare	Comcast	2008	2015	7	8	No	0	0	2	Yes	7	Unknown	4	30	Yes	Yes	3
Windham	Comcast	2006	2013	0	N/A	N/A	0	0	0	N/A	0	N/A	0	0	N/A	N/A	N/A

Source: www.iwantbroadbandnh.org/cable-franchise-agreements

Appendix I: Boston's Grant of Location Policy

IN PUBLIC IMPROVEMENT COMMISSION
OF
THE CITY OF BOSTON

POLICY RELATING TO GRANTS OF LOCATION FOR NEW CONDUIT NETWORK FOR THE PROVISION OF COMMERCIAL TELECOMMUNICATIONS SERVICES.

1. The policy objective of the City of Boston, acting through its Public Improvement Commission " PIC ", " the City ", or " the Commission ", is, consistent with public interest, to maximize the availability of new conduit networks { " Networks " } for the provision of commercial telecommunications services within the City and to minimize multiple street openings and resulting disruption to the public ways. This policy shall apply to each Network constructed within the Telecommunication Impact Area, as defined in the attached statement, and as adopted by vote of the PIC on March 1, 1990, and shall apply to Networks constructed outside said Telecommunication Area if there is more than one Network to be constructed. Repair of conduit in such disrepair that substantial replacement is required shall be considered " new " conduit subject to this policy. The phrase commercial telecommunications services is intended to be broadly defined and be all inclusive of any and all public or private telecommunications services provided in any manner by a Network operator.

2. Specifically, the PIC adopts the following policy objectives to be met in the construction, installation and

maintenance of new conduit for the use of one or more Networks. The actions to be taken by the Network operators and the City will [i] minimize disruption to the City's public ways, [ii] allow the planned development of telecommunications facilities within the City to benefit Boston's economy, [iii] provide future Network applicants reasonable and timely access to City streets and [iv] facilitate the timely construction of all such Networks.

3.   Therefore, pursuant to the authority vested in the PIC. the following policy is hereby adopted.

I.   **Minimize Disruption to the City's Public Ways**

4.   The Public Improvement Commission has the duty to regulate and oversee the use of the City's public ways, subterranean spaces and air-rights. The Commission finds that the management of the public ways has been made more complex because of the recent increase in building construction in the core of the City, the attendant activity in and under City streets, and a corresponding increase in vehicular traffic. Further, the Commission finds that the depression of the Central Artery and construction of the Third Harbor Tunnel will create significant future complexities in all aspects of the management of Boston streets.

5.   To minimize the number of street cuts and to allow all Network applicants reasonable access to City streets, in

193

principle only one new grant of location for new conduit for commercial telecommunications services will ordinarily be issued by the Commission for each downtown street or part thereof located within the Telecommunications Impact Area but such a grant may be made to two or even more applicants simultaneously.

6.   Generally, the first responsible applicant for grants of location will become the " Lead Company " with the overall operational responsibility for the installation and maintenance of new conduit at the requested locations.   The P.I.C. will expect to communicate with only one such Lead Company concerning all aspects of a conduit construction project and future maintenance of the public ways no matter how many other firms are also licensed to occupy the designated locations.   The PIC reserves the right to designate a Lead Company, if necessary, in furtherance of this policy.

7.   Within five days following a preliminary review of its initial application by the staff of the PIC or at such other time as the PIC may allow, the Lead Company must notify all companies whose names are on file with the PIC. and must give the same notice by publication.   Such notice shall disclose where the Lead Company intends to construct conduit and contain a clear map of the proposed route or locations including all proposed lateral or connecting conduit to specific locations. The Lead Company shall invite all other firms to join with it in placing their own conduit and laterals in all opened streets on

a cost-shared basis. Interested companies have **10 business days from the receipt of the notice to respond to the Lead Company** informing it of their intention to enter into a joint construction project. share costs, and jointly occupy some or all of the designated locations. Prior to and during construction, all service connections applied for from the Department of Public Works by a Lead Company or a Participant in a Network project after an original plan and map have been submitted as required herein shall notify all other participants in the Network project of such application and shall afford an opportunity for each to place conduit in such service connection if requested; in every case City conduit shall be installed in such service connections unless waived by the PIC.

8. Thereupon, all interested companies [Participants] shall work with the Lead Company to submit a coordinated plan to the PIC. **Each company shall file amended or simultaneous applications for the desired grants of location within forty [40] days of the receipt of the initial notice from the Lead Company, or such other time as the PIC may allow.** Each application will include specifications indicating the number and size of the conduits to be constructed as well as a plan for the maintenance of and access to the proposed conduit system. Ordinarily, grants of location will not be issued to the Lead Company or any other Participant in the project unless the PIC is satisfied that all interested firms have had an opportunity to place their conduit in all the requested locations and each

shall have executed a "Participant's Agreement" as defined in paragraph 10 of this policy with the Lead Company and the Lead Company shall have executed a "Lead Company Agreement", as defined in paragraph 15 of this policy. Among engineering specifications that may ordinarily be required, manholes or handholes shall be installed at major intersections, or other designated locations, at such appropriate intervals as the PIC may deem necessary. Laterals and service connections shall not ordinarily exceed 250 feet in length and shall be located to minimize traffic disruptions and future street openings. The use of pedestals or any surface mounted structures shall require both PIC and Department of Public Works approval.

9. **Once the PIC has granted locations, the Lead Company must begin construction within 90 days, unless in conflict with the Commission policies prohibiting winter holiday season construction; otherwise, its grants of location shall expire and become void.** Ordinarily, when any Network conduit trench is being constructed, the City will inspect the trench area with a representative of the Lead Company prior to the completion of the construction. The City retains the right, upon inspection or upon determination that a condition hazardous to public health and safety exists as a result of Network construction, to order such additional work or modifications as may be required to correct any such defects or condition. Any increased fee, deposit or additional cost incurred shall be deemed a shared cost for which Lead Company and Participants shall be liable.

196

All Participants in a Network at their sole cost and expense shall abide by all City of Boston and Department of Public Works rules, regulations and practices, including specifically requirements relating to street resurfacing and reconstruction; all costs of compliance shall be deemed shared costs among Network Participants.

During the backfilling of any trench area the City may, at its option, provide inspectors, the cost of which shall be paid for by all Network participants as a shared cost.

All Network participants shall abide by the City's special regulations pertaining to the list of streets which were reconstructed or resurfaced during the preceding 5 years, and shall be liable for all costs of cold planing and all costs of curb-to-curb resurfacing required for said streets. All such costs shall be deemed shared costs among all Network participants.

10. In the event there is in fact more than one applicant for the same locations, all such applicants shall enter into a contract, the " Participant's Agreement ". to construct, manage, and maintain the proposed conduit system on a cost shared basis. Each Participant's Agreement shall be substantially in the form and content as attached hereto, entitled Model Participant's Agreement.

11. Consistent with the public interest, the review of all license applications shall include a review by the PIC of any

Lead Company Agreement or Participant's Agreement contract provisions, including but not limited to : sharing, disclosure, and certification of costs; escrow agreement; rights and responsibilities of other licensee companies; construction scheduling; coordination of access to the proposed conduit; maintenance of conduits; ownership; maintenance and access to manholes; liability issues; and administrative matters.

12. To assure that conduit capacity will be available in the future without the need to make repeated street openings, the City will normally contract with a licensee [or joint licensees] to install a spare or additional conduit [the City Conduit] alongside any new conduit within the Telecommunications Impact Area or, in the event that there is more than one licensee in a Network to be constructed outside the Telecommunications Impact Area, in such Network, unless waived by the PIC according to paragraph 18 hereof. The City Conduit will parallel all such newly constructed conduit whether characterized as " trunk " or " lateral ". City conduit shall extend to the property line of any location to which the Lead Company or any Participant is connected. The City Conduit shall be deemed to be a shared cost among all Licensees in a Network and shall be constructed by the Licensee or joint Licensees in such Network but thereafter the City Conduit itself will be owned and maintained by the City of Boston, which will hold it for future use.

13. Network applicants applying to the PIC for new locations after streets have already been cut and new conduit installed, including the City Conduit, shall normally be expected to locate their cables in the City Conduit, or, upon appropriate application, in other existing conduit. **The City Conduit, as installed, consists of four [4] separate 1-1/4 plastic pipe sections or their equivalent, [each a " City Conduit Section "] fused into a single bank.** In order to assure non-discriminatory and efficient use of the City Conduit, and in order to promote efficiency of use, persons wishing to lease the City Conduit shall in any application for a grant of location demonstrate the need in fact for that number of City Conduit Sections for which grants of location and rental agreements are sought, and no rental agreement shall be executed until and unless the P.I.C. finds that the number of City Conduit Sections to be leased are in fact needed by such applicant and will be forthwith used by and useful to such applicant.

In furtherance of this policy, subject to availability, the City will make available each City Conduit Section to any and all subsequent licensees for fair and reasonable compensation on a non-discriminatory basis, as generally set forth in the Model Lead Company Agreement in Section 4.4 and Schedule D thereof and as specifically set forth in the Model Rental Agreement defined in this paragraph. The Lump sum payment to be made pursuant to said Section 4.4 said Schedule D, and the Model Rental Agreement shall be made

separately for each City Conduit Section to be leased. At the time the PIC grants any location for the use of any City Conduit Section, it shall determine an additional annual rental payment to be made based on a review of then current market data relating to the rental of comparable conduit in Boston. During the calendar year 1999 and every fifth year thereafter, the PIC shall make a finding of the applicable market rental rate for all leases of City Conduit Sections and such rental rate shall apply to each such lease for the next five calendar years. At the time the grant of location is made and the rental agreement is executed, pro-rated rent shall be payable for the remainder of the calendar year. Thereafter, all annual rent shall be paid in advance on or before the fifteenth day of January of each year.

Each lease of a City Conduit Section shall be in accordance with the terms and conditions of a standard rental agreement with the City [the "Model Rental Agreement"] which shall be substantially in the form and content as attached hereto. Any person who leases a City Conduit Section shall be required to become a Participant in a Network and both the Lead Company and the lessee of City Conduit shall be required to execute a Model Assignment, Assumption and Consent substantially in the form attached hereto. The Model Rental Agreement shall also provide that the lessee will assume its share of the City's existing obligations to the Lead Company for each City Conduit Section leased.

Any and all lateral or service connections constructed with respect to any leased City Conduit Sections, and any and all manholes or handholes constructed, shall be at the sole cost and expense of the lessee and shall only be installed after design approval by the staff of the PIC.

After a Network is constructed, the construction of new lateral conduit for the purpose of making service connections to particular addresses shall be governed by the provisions of a Lateral Lead Company Agreement between the City and a Licensee, all as appearing substantially in the Model Lateral Lead Company Agreement attached hereto. Licensees, other than a Lead Company that has already constructed new conduit networks may, upon execution of a Lateral Lead Company Agreement. perform construction of laterals according to the provisions of said agreement. Any Licensee constructing laterals shall locate new City Conduit, that is, four [4] 1-1/4 inch pipes, in such locations at the sole cost and expense of the Licensee, or in the event that other Participants locate conduit at such time, as a shared cost, as the case maybe.

The PIC expressly recognizes the competitive necessity of establishing prompt service connections in each Network within the Telecommunication Impact Area, and requires that each licensee constructing laterals, manholes, handholes or service connections facilitate such connections for all licensees in an expeditious manner. Any entity licensed to be in a Conduit System, including any lessee of a City Conduit Section, shall have the right to petition the Chairman of the PIC for

enforcement of this policy in the event that any licensee fails to fulfill any of its obligations with respect to the construction of service connections or Laterals in an expeditious manner.

14. All conduit whether existing or newly constructed may only be occupied, operated, and maintained pursuant to a grant of location granted by the PIC , or the City's predecessor licensing authorities.

15. In order to implement this policy, a contract between the City and each Lead Company shall be required. The City and the Lead Company shall execute a contract, the " Lead Company Agreement ", substantially in the form and content attached hereto, entitled, Model Lead Company Agreement. Through the Lead Company Agreement and the Participant's Agreement, licensees will agree to take all needed steps to abide by the P.I.C.'s policies and procedures, install the City Conduit, minimize street cuts, and take appropriate steps to minimize traffic disruption and damage to the integrity of city streets. Each Lead Company Agreement and each Participant's Agreement must be executed prior to any vote of PIC granting any location for that Network.

II. **Encouraging the Orderly Creation of Telecommunications Conduit That Will Materially Benefit Boston In The Future.**

16. Over time, the City seeks the construction of a conduit Network that will serve the needs of the future telecommunications users, including public safety and other critical public services. Initially, such conduits will be located chiefly in the Downtown Financial District and Back Bay, but will also reach out to other neighborhood locations within the Telecommunications Impact Area. An extensive conduit system will eventually serve the maximum number of commercial and public buildings as well as such other locations as a licensee may apply for. The number and size of conduits to be installed as part of the new conduit system, as well as lateral branching, shall be approved by the PIC and incorporated into any license issued for a grant of location.

III **All Network Applicants Shall Have Access to City Streets On a Non-Discriminatory Economic Basis.**

17. Future Network operators who are not joint licensees during the construction of new conduit may apply at any time for licenses to occupy the City Conduit. Consistent with paragraph 13 herein, the City will lease its conduit space to such subsequent Network licensees " Future Participants " on a non discriminatory basis according to the terms and conditions set forth in the Model Rental Agreement with the City, and in accordance with the Model Lead Company Agreement and Model Assignment, assumption and Consent and specific executed Lead Company Agreements relating to the specific locations which such Future Participants wish to utilize. The Commission recognizes

that in certain cases not all future licensees will be able to utilize the City Conduit. If the City Conduit is unavailable or inappropriate, subsequent license applicants may be permitted to install their own new conduit.

18, The City retains the right to waive the City Conduit requirement; however, if it intends to waive the City Conduit requirement it shall give public notice of its intention to do so and the PIC shall vote to make such waiver and state the reasons for so doing . The City reserves the right to use its conduit for any purpose whatsoever, but its use will be compatible with other telecommunications uses in the same locations.

19. The PIC shall issue such rules and regulations as may be necessary to interpret and implement this policy.

IV   Facilitate Construction of Networks

20. The City will encourage the design and installation of new conduit for licensed Networks as quickly as possible. To this end, the procedure to apply for a revocable license for the grants of locations required before construction or occupation of a conduit system is summarized as follows:

1.) Applicants shall disclose to the PIC all data requested in the City's Request for Information.[See e.g.

Request dated May 6, 1988.]

2. Applicants will be given a timely and public

    opportunity to testify before the PIC on the merits of

    any license or joint license application.

3. Grants of location shall be made subject to conditions
    to assure compliance with the PIC policies, and

    procedures, as herein adopted or   later amended.

4. Applicants issued grants of location shall

    simultaneously enter into a   contract with the City

    concerning the manner in which new conduit shall be

    constructed and occupied.

5. Licensees shall be required to comply strictly with all

    ordinances, PIC procedures and regulations, contractual

    provisions and license conditions as well as

    administrative procedures concerning street opening

    permits, construction scheduling, and traffic

    management.

Adopted by vote of the Public Improvement Commission on   August 4, 1988.

Amended by vote of the Public Improvement Commission on March 1, 1990.

Amended by vote of the Public Improvement Commission on April 28, 1994