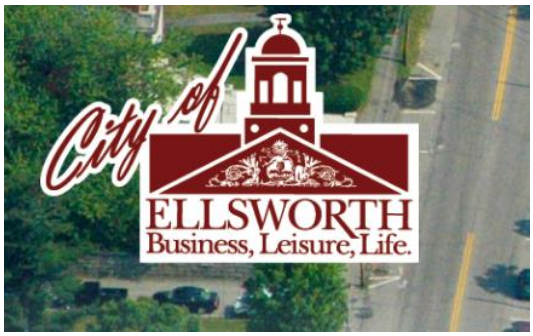
MUNICIPAL BROADBAND ROADMAP



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City of Ellsworth
Municipal Broadband Roadmap

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NOTE: Terms in **bold font** in this document are defined in the glossary in Appendix A.

Executive Summary

Mission Broadband, Inc. is pleased to provide the City of Ellsworth, Maine (City) with a Municipal Broadband Roadmap (Plan) as it relates to the City's desire for a community-wide robust and affordable broadband network.

Like many communities in America, the City of Ellsworth is feeling the effects of gaps in broadband service within the community. Although there are multiple Internet Service Providers (ISPs) offering broadband services within the Ellsworth community, data gathered shows that nationally recognized problems such as insufficient access for remote workers and students, insufficient access for telehealth services, minimal investment by existing providers, affordability and the Digital Divide are real and present issues in the City. These real and present issues around broadband accessibility and cost have been exacerbated by the COVID-19 pandemic, which has resulted in a flurry of federal activity and money being directed towards broadband accessibility problems throughout the nation. Developing a strategy for expanding reliable and affordable broadband service is extremely important for the future of the City.

Through an iterative process of collaborating with the City's management team, the City's Broadband Committee, businesses, the public sector and other stakeholders, data gathering tasks were conducted which have helped guide the development of this Plan. Other aspects overviewed in this Plan are the community's interest in supporting the exploration of a municipal broadband project as well as the potential usage and application of a broadband network.

Many factors need to be considered in developing a city-wide strategic broadband plan, to include ownership models, capital expenses, operational expenses, financial feasibility, end user take rates, variations in end user costs, outside plant facilities, rights-of-way (ROW), central office (CO) facilities, electronics, supply chain management, etc. Independent of ownership models, a determination of long-term success will be the utilization of the network, as well as applications supported on the network, and how those applications and services help to service the community and shape Ellsworth's future.

Over the past several months, the City of Ellsworth and Mission Broadband have worked collaboratively to gather data from the public and key stakeholders connected to this issue. This work has shed light on five areas that are considered to be impacted by lack of ubiquitous broadband access. These five areas are as follows:

- Economic Development
- Healthcare
- Public Safety
- Education
- Government/Environment/Transportation

This Plan summarizes the concerns and perceived benefits of the impact of broadband on these areas of society. The Plan also addresses perceived risks of doing nothing and letting market forces dictate the broadband landscape in the City of Ellsworth. One of the primary issues that will need to be resolved in this process is to reach consensus on the issue of digital equity. There are variable costs associated with providing service to subscribers depending on where they are located in the community and the cost of attaching the subscriber's premise to the network. Listed below are recurring themes which have arisen during this process and are highly relevant to the greater citywide broadband discussion.

- How would the City benefit from ubiquitous high-speed broadband services?
- What impacts would the City experience by not improving broadband services?
- How does the City address the affordability issue for consumers surrounding any broadband solution?
- How does the City of Ellsworth address the digital equity issue, ensuring that citizens have access to robust broadband regardless of their location within the community and/or regardless of their income level and financial abilities?

The strategic Plan outlined below is an overview of the current state of broadband in the City of Ellsworth. The Plan also outlines the current efforts to understand the residential and business needs of a robust broadband network. In addition, the Plan will identify municipal network models, risks, and next steps for the City of Ellsworth to consider. This current document will need to be updated as the City of Ellsworth continues with its broadband vision and exploration of the feasibility of deployment of a municipal broadband network.

Note on clarification of terms for the purpose of this Plan:

As you read the report it is important to understand the term "broadband" as well as the bandwidth speeds associated to this universally used term "broadband." A Glossary is located in Appendix C but for the sake of clarification the following reference will be beneficial.

The term "broadband" has been universally adopted to replace the terms "internet" and "bandwidth", so when the term broadband is used, its use is referring to access to the Internet or World Wide Web (WWW).

When broadband speeds (bandwidth) are stated, they are referred to as download and upload, as well as asynchronous and synchronous. A download speed is the transfer of data from the internet to a device, such as a computer or router. An upload speed is the transfer of data from a device, such as a computer or router, to the internet.

Asynchronous is defined when your download and upload speeds are being delivered at different bandwidths such as 25 Megabits per second (Mbps)/3 Mbps. Often the Mbps is left off and is simply referred to as 25/3. Synchronous is defined when the download and upload speeds are being delivered at the same bandwidth such as 25/25.

The Federal Communications Commission (FCC) defines adequate broadband as a download speed of 25Mbps and an upload speed of 3 Mbps or 25/3.

Experts and users in technology have long argued that the FCC's baseline definitions of broadband are simply too low. Recent grant and funding opportunities at both the Federal and State levels indicate higher speed requirements for communities or service providers who will use grant dollars to build out networks.

Mission Broadband supports the requirement for higher bandwidths than the FCC standard for today's uses and to provision for a reliable futureproof infrastructure. For the purpose of this document, when broadband is referenced, the stakeholder community interviewed defines their use of necessary high-speed broadband as 100 Mbps/100 Mbps and robust broadband as 1 Gigabit per second (Gbps)/1 Gbps.

Current State of Broadband in Ellsworth

There are multiple ISPs providing services in the City of Ellsworth utilizing a variety of technologies to deliver service including copper cable, coaxial cable, cell phone hot spot, fiber optic cable, fixed wireless, and satellite. This information is derived using existing federal and state broadband mapping tools, provider websites, a citywide broadband survey taken by residents and businesses, and the consultant's knowledge of local providers. The FCC national broadband map also identifies multiple providers available throughout the City.

Broadband service is available in Ellsworth's "urban core," particularly in its commercial districts such as downtown/Main Street, High Street, Myrick Street, and the Downeast Highway. Major roads such as the Bangor Road/Oak Street/State Street (Route 1A), the Surry Road (Route 172), and the Bucksport Road (Route 3) have fiber running down them. However, not all residential customers have access to fiber along these corridors, though they do have access to broadband through providers such as Spectrum. It is important to note that while these areas of Ellsworth seem to have either fiber or broadband service, there still is not 100% coverage within these locations. Additionally, subscribers who only have Spectrum for an option will have maximum upload speeds of 35Mbps until Spectrum upgrades their Hybrid Fiber Coax (HFC) network in Ellsworth to provide more capacity. The estimated number of premises that have access to broadband service is 2,800.

The City of Ellsworth has a franchise agreement in place with Spectrum that expired in 2013. Spectrum is required to build out when density reaches 18 year-round homes per mile on a public right-of-way. In June of 2021, Spectrum notified the City of Ellsworth that it was planning to expand its network with fiber-to-the-home capabilities to serve roughly 130 homes on the following roads: Nicolin Rd., Harmony Way, Herbs Way and Upper Boggy Brook Rd. The City of Ellsworth is in the process of contacting Spectrum to understand the status of this expansion.

Broadband service is not as readily available in the northern section of Ellsworth, off of the Mariaville Road (Route 180), North Street (Route 179), Nicolin Road (pending status of Spectrum expansion outlined above), and Winkumpaugh/Happytown roads. Generally, the areas surrounding the City's major lakes (i.e., Green Lake, Branch Lake, and Graham Lake) do not have broadband services. The City estimates that approximately 1,200 premises could be served by expanded broadband infrastructure in these areas.

The City of Ellsworth has received emails from residents living in areas where internet service providers do not offer service that indicate these residents would be interested in subscribing to broadband and that they support the community's efforts to expand broadband. One email is from a resident living in the western portion of Ellsworth and the other is from a resident living in the northern portion of Ellsworth, both in areas outside of Ellsworth's urban core. The City also received letters of interest to be on the City's Broadband Committee from several Ellsworth residents and business owners. These letters demonstrate support in the community's efforts to expand broadband.

The Ellsworth Business Development Corporation (EBDC) represents the largest business sectors that make up the City of Ellsworth's economy. This Board has held discussions with City representatives on how to best move forward with broadband expansion in the City. The Board previously helped the City acquire a grant in order to establish a three-mile open network

broadband line through a portion of the City's urban core and they continue to have a desire to assist the City with closing broadband connectivity gaps. The City Council also provided a directive to City staff to create a Broadband Committee, with two councilors serving on the committee (both councilors live in areas where broadband connections are limited), further emphasizing that community support in expanding broadband continues to build in the City.

In 2021, the City engaged in conversations with three ISPs serving Ellsworth: Spectrum, Union River Telephone, and GWI. These conversations lead to the understanding that Spectrum is planning on expanding broadband in the area of the Nicolin Road, closest to Green Lake, and that Union River Telephone has future plans to expand further into Ellsworth down routes 180 and 179. At the time of these conversations both Spectrum and Union River Telephone were planning to build fiber-to-the-premise networks. It is important to note that these plans are based off of conversations with providers and that concrete details were not provided during these conversations.

There is a general industry agreement that FCC mapping data is challenged in its accuracy, however, it does provide one source of data for review and comparison. The new Connect Maine mapping tool, still under refinement and updating, also indicates multiple ISPs providing service to all areas of the city. Both the FCC and Connect Maine data sources indicate a high percentage of structures in the city of Ellsworth have access to at least 25Mbps / 3 Mbps. Analysis of the City's survey responses finds that Spectrum and Consolidated Communications have the majority of the residential subscribers in Ellsworth, at nearly 94%. Still, the survey responses, anecdotal emails and public comment received by the City and in working group sessions indicate gaps in broadband coverage.

The City of Ellsworth has been proactive in its approach to expanding broadband and currently owns a state-of-the-art fiber optic network that serves a three-mile section of downtown Ellsworth. The network is designed to be flexible and expandable, so as the community's needs change, the network can grow to accommodate them. More detailed information on the project can be found at the following link: https://www.ellsworthmaine.gov/fiber/.

The City and State have many online services available to residents with broadband access. Services include the ability to pay and research real estate tax, personal property tax and utility bills, a GIS website with parcel information and record cards, online video streaming of municipal meetings, library catalog, registration renewals for motor vehicles, boats, ATVs and snowmobiles and online motor vehicle crash reports. Broadband is also critical for municipal operations as more applications are moving to the cloud.

The City's broadband survey results reinforce that the availability of access to high-speed internet and fiber optics is an issue in many areas of Ellsworth. The survey indicates that less than 1% of residents have access to fiber-based internet service. The survey further indicates that nearly 60% of respondents have less than 10 Mbps for upload speeds, which is the new minimum standard for the broadband definition in the State of Maine. There is a high rate of dissatisfaction with the current providers for a variety of issues including cost, slow service, and unreliable service.

Broadband affordability can be an issue with lower income households within the City. Although access to broadband services is available to these housing units, income levels may prohibit the subscription to broadband service.

Overall, broadband access is available in most areas of the City; however, gaps in coverage are

causing residential and business broadband access issues. The majority of subscribers use Consolidated Communications (CCI) or Spectrum according to the broadband survey results, both of whom are providing services over legacy copper-based networks.

High speed broadband is limited and not available across all sectors of the City. Affordability is an issue among lower income residents and is also a concern for the City's small businesses. A lack of existing broadband service providers investing in a robust ubiquitous broadband infrastructure is a recognized concern for the current and future state of the City's requirements.

City Broadband Vision & Goals

In addition to the City taking initiative to install a three-mile fiber network in downtown Ellsworth, they also, with the support of Ellsworth residents/businesses and the City Council, applied for and were subsequently awarded a Connect Maine Planning Grant in July 2021. In anticipation of applying for the grant, the City formed a Broadband Committee, comprised of representatives from the City (staff/council), residents, and businesses. The table below indicates the members of the committee and their roles.

Ellsworth Broadband Committee Members

Name	Roles
Glenn Moshier	City Manager
Jason Ingalls	City IT Administrator
Janna Richards	City Economic Development Director
Josh McIntyre	City Finance Director
Heather Grindle	Former City Councilor, Ellsworth Resident
Gene Lyons	City Councilor
Scott Morrill	IT Manager, First National Bank
Rick Cowan	Vice President Information Systems, Northern Light Health Care
Keith Corson	Network Engineer, The Jackson Laboratory
Laura Johns	Director of Information Technology, Ellsworth School Department
Kelly Bellis	Ellsworth resident, former small business owner
Tom Beal	Ellsworth small business owner

The City's Broadband Committee met in June and August of 2021. Part of the discussion at these meetings revolved around the broadband vision and goals for the City. There are a lot of commonalities between committee members and their desire to see more available and affordable broadband in the City. Workgroup meetings with City stakeholders also reinforced these visions and goals, as well as expanded upon the list. These visions and goals are outlined below. It is expected that these visions/goals may become more refined over time, as the City works further toward a more defined broadband project.

- Determine needs of city residents and businesses for broadband availability and desired bandwidth.

- Determine community areas impacted by lack of ubiquitous high-speed and robust broadband and projected benefits that could be realized in each area with ubiquitous high-speed and robust broadband.
- Evaluate, determine, and prioritize broadband needs for the City and/or sections of the City.
- Determine support within the community for a municipally supported or owned broadband project.
- Determine best method of investing in broadband in Ellsworth in order to make high speed/robust internet access ubiquitous in Ellsworth by eliminating gaps in capacity, access and affordability. The long-term viability of the solution chosen is an important requirement.
- Explore the financial and operational viability of various Municipal Broadband Network Models to determine the model that provides the best long-term viability and will ensure the test of time.
    - Municipal owned and operated open access network
    - Public / Private Partnership
    - Blended municipal network
- Identify how to expand the municipalities' fiber footprint to enable Smart City capabilities and applications of the future.
- Promote and increase digital literacy skills throughout the entire community.
- Promote and plan for the use and wide-spread adoption of broadband technologies in government, energy conservation, transportation, health, education, and public safety.
- Provide adequate, ubiquitous broadband so every residence can gain access to the following:
    - Online educational services (including working toward closing the homework gap),
    - Telehealth and remote patient monitoring,
    - Working remotely, and
    - Online social services.
- Ensure establishment of high quality, fast broadband to promote/support business, commerce, and economic development.

Overview of Data Gathering Efforts

Mission Broadband worked with the City of Ellsworth throughout the fall of 2021 to conduct information and data gathering sessions. Data gathering efforts to inform this Plan include the following:

- City department meetings,
- A citywide broadband survey (more details in the next section of this Plan),
- A public forum (held on November 10, 2021 at City Hall in Ellsworth in order to share information about the broadband initiative to date as well as answer any questions from the public or other stakeholders), and
- City broadband committee meetings.

The discussion with City departments, the broadband committee, and at the public forum focused on how the following areas of society are impacted by the availability or lack of reliable broadband:

- Economic Development;
- Healthcare;
- Education;
- Public Safety & Emergency Response;
- Government/Environment/Transportation;
- Digital Equity.

The five primary areas outlined above align well with nationally recognized areas of concern arising from the broadband discussion. The impact that inadequate and unaffordable broadband has in each of these areas is discussed below. In addition, perceived benefits that could be realized if the City of Ellsworth moves forward with a project to improve citywide broadband is also presented below.

To summarize, the underlying themes for the data gathering work were:

- The effects of <u>not having</u> high-speed/robust, reliable, and affordable broadband in the City of Ellsworth.
- The effects of <u>having</u> high-speed/robust, reliable, and affordable broadband in the City of Ellsworth.

Economic Development

Economic Development is often a key driver for communities considering the expansion or implementation of municipal broadband networks. The City of Ellsworth has a strong economy; however, businesses need to be able to participate effectively and consistently in the global digital environment and economy and cannot afford broadband unreliability. Areas of the City that continue to struggle with gaps in broadband service will not be a well-suited geography for current or future businesses, including home businesses. The ability of businesses to connect to the global digital economic landscape is vital to community health and growth. Recent trends, influenced by the pandemic, show an increase in the number of home businesses as well as remote workers located in the City or interested in moving to the greater Ellsworth area. To stay relevant with these trends, and to attract, retain, and develop both residential and business sectors in the City, high-speed, robust, and reliable broadband must be able to be accessed at an affordable rate.

Lack of robust and affordable broadband in Ellsworth could have the following undesirable impact on economic development:

- Lead to continued inefficiencies in businesses performing online functions such as:
    - Video conferencing & streaming services;
    - Large file transfers;
    - Employee training;
    - Working with cloud applications.
- Make it difficult to attract and retain businesses of all sizes.
- Make it difficult to attract and retain remote/virtual workers.
- Adversely impact **digital literacy**, which limits the pool of capable workers.

Having robust and affordable broadband in Ellsworth could have the following positive impacts on economic development:

- Increased commercial activity and new businesses will result in more residents moving to the community which will help stabilize and / or lower the tax rate.
- Increase efficiencies in businesses.
- Provide greater workforce attraction and retention.
- Stimulate interest in surrounding communities.
- Help keep youth in the community post high school and college.
- Benefit the various economic sectors, including the tourism industry in Ellsworth.
- Allow the business community to better leverage the global economy.
- Provide greater remote and virtual access to Ellsworth businesses and talent.
- Help in attracting new businesses & stimulating home businesses.
- Help in attracting new residents.
- Provide better options for remote training for organizations.
- Provide better remote / virtual workforce capabilities (e.g., Customer Service Representative professionals).
- Improve digital literacy skills over time, enabling a stronger workforce.

Healthcare

Telehealth is emerging as a critical solution to the crisis in healthcare costs and access. Healthcare continues to use many new telehealth technologies to deliver services such as, telemedicine, tele-psychiatry, video conferencing, remote patient monitoring (RPM), mobile health (mHealth), electronic health records (EHRs), physical therapy (PT), patient portals, and picture archiving and communication system (PACS). Lack of adequate broadband services to households limits healthcare providers' ability to offer these services to their patients. Telehealth technologies have real-world advantages in communities, helping with inadequate transportation resources, limited physician resources and limited emergency room availability. Ongoing remote patient care can limit trips for seniors, provide care for those with chronic diseases and help parents with pediatric needs. Consultation services between specialists and primary caregivers as well as field work for social workers take advantage of broadband services in the home. Advancements in technology allows remote diagnostics imaging to be transmitted to healthcare experts for review with

immediate attention given to a patient as required. Healthcare and social services are using remote access for educational purposes, helping educate patients on their conditions and how to help themselves through diet, exercise, and prescriptions. Hospice also utilizes household broadband access to support the families and nurses caring for their loved ones. Telemedicine services for mental health and addiction recovery services is helping battle the opioid crisis and holds the promise of delivering much needed treatment to those struggling with addiction who need daily clinical consults and live many miles from treatment centers.

The COVID pandemic over the last two years has caused a significant amount of disruption in the provision of medical services by health care providers to their patients. Health care facilities have been overwhelmed in a variety of ways and many are facing critical resource shortages in skilled areas. Throughout the pandemic the use of telehealth and telepsychiatry services has skyrocketed as services have shifted from in person to online and there is every indication that these changes are permanent.

Northern Light Health published a report using public data gathered by Maine's Community Health Needs Assessment (CHNA) initiative. This report contains statistics from Hancock County related to income, poverty, and disease rates among the population. High-level statistics are outlined below (the full report is available if more information is desired). Out of the data collected through the CHNA initiative, consider these percentages:

- 13.8% do not have access to the internet.
- ~38% of primary care visits involve patients who live more than 30 miles away.
- 14% experience three or more chronic conditions.
- 27% are 65 and older living alone.
- 14% - have a disability.
- 22% experience lifetime depression struggles.
- 19% are 18-year old's who seriously considered suicide.
- 17% are 17-year old's who seriously considered suicide.

Lack of robust and affordable broadband in Ellsworth could have the following undesirable impacts on healthcare:

- Lead to continued high costs for medical care.
- Lead to a lack of access to specialists or require travel to see specialists.
- Lead to increased hospitalizations and insurance costs if patients cannot be monitored remotely.
- Reduce the availability of critical social services and telepsychiatry services.

Having robust and affordable broadband in Ellsworth could have the following positive impacts on healthcare:

- Provide more cost-effective access to medical and psychological services via telemedicine and telepsychiatry services.
- Ability of all citizens to participate in fitness programs offered online. These programs will help participants feel a sense of inclusion while also allowing them access to a variety of

instructor led and self-paced fitness and relaxation classes including aerobics, stationary biking, yoga, Tai Chi and meditation.

- Reduce travel burdens and costs for some patients.
- Reduce costs for providers.
- Enable expansion of services.
- Provide remote patient monitoring.
- Increased access to expertise.
- Provide more common access to Electronic Health Records.

Education

Universal broadband coverage in America is essential for education at all levels. Through the Maine School and Library Network (MSLN), the schools and libraries in most Maine communities, including Ellsworth, have robust broadband service available, however, the nationally recognized "**homework gap**" persists and continues to affect many students throughout the State of Maine and in Ellsworth as well. This could have the result of impacting students who are potentially more likely to fall behind academically. E-Learning and a growing industry of college online courses also require robust broadband service. New technologies such as Augmented Reality (AR) and Virtual Reality (VR) require highly robust broadband services and are increasingly being used in teaching methods.

Younger generations are learning and experiencing life in a completely digital era. Universal broadband is required to eliminate the **digital divide** which will only keep growing if things remain status quo. Online training often requires two-way video communication and students will increasingly use the internet to receive curriculum. Other segments of the population, such as homebound residents, and seniors, also need to access educational and job training resources through broadband connections.

The pandemic has proven that, in order for education to shift to remote learning, where classes are taught over the internet, every student will need access to robust and reliable broadband, regardless of the student's physical location or income status. It has been common occurrence over the past 18 months to hear stories about parents driving their children to locations that have free wi-fi hot spots in order for schoolwork to be completed. The lack of **digital equity** is apparent in these stories and has added stress to families who were already struggling with adapting to the new normal of a global pandemic.

Lack of robust and affordable broadband in Ellsworth could have the following undesirable impacts on education:

- Perpetuate the homework gap.
- Create inequities in assignments between those with internet access and those without.
- Increase the digital divide and demotivate students.
- Decrease educational access to some K-12 students who do not have broadband at home.
- Decrease access to education services requiring high speed access for some students.
- Limit ability of participating in higher education online courses.

Having robust and affordable broadband in Ellsworth could have the following positive impacts on education:

- Resolve the homework gap.
- Continue to narrow the digital divide.
- Provide access to online classes 24/7.
- Create consistency in the educational process for all students.
- Support new learning and teaching methods such as AR and VR.

Public Safety & Emergency Response

Public safety is also an important driver for communities considering the implementation of municipal broadband networks. Many benefits in the area of public safety can arise from the implementation of a municipal broadband network. The City of Ellsworth has already constructed a fiber network to interconnect all of the municipal offices. The Police, Fire and Ambulance services consider broadband to be critical infrastructure and continuing to expand broadband throughout the community would enhance the City's public safety services. Additionally, as the City's population grows, more consideration will be put toward building new, rural off-site locations for fire, police, and/or ambulance services. When siting these facilities, fiber connectivity will need to be factored in and addressed.

Lack of robust and affordable broadband in Ellsworth could have the following undesirable impacts on public safety:

- Impact the City's ability to integrate **Smart City** features into public safety services in the future. An example of such a feature would be the automated management of traffic signaling to allow first responders the fastest possible route to an emergency location. Additionally, first responders could be sent images of a physical property and building schematics while enroute to the emergency location.
- Impact the City's ability to keep pace with technological advances and applications in the area of public safety that could benefit the community.
- Reduce opportunities to use technology to increase efficiencies and lower the costs of municipal operations.
- Continue to impact the speed with which law enforcement and first responders can access information in emergency situations.

Having robust and affordable broadband in Ellsworth could have the following positive impacts on public safety:

- Allow for deployment of public safety technology devices.
- Allow emergency personnel and first responders to have absolute priority on the network.
- Help dispatchers provide real time data to first responders such as floor plans of buildings.
- Provide access to video and imaging in real time by placing cameras anywhere in the city.
- Allow responders to have access to more data.
- Allow for end-to-end control of municipal assets, to include streetlights.
- Allow for real time traffic control during local or regional emergencies.

- Allow for remote monitoring of municipal systems and assets.

Government, Environment and Transportation

A robust municipal broadband network in Ellsworth could provide benefits to all of the areas of Government, Environment and Transportation. The **Internet of Things (IoT)** will exponentially increase the number of devices that connect to the internet and allow real time information from a variety of new sources to inform decision making in all areas. The IoT will offer opportunities to improve efficiencies in water and utility systems and to place sensors to gather data in strategic locations to monitor streetlights, crowds, air pollution levels, water levels, waste management, and other community functions/systems.

The City is the service center for Downeast Maine and the Acadia region and, as such, experiences significant traffic, particularly from April through October, with over 4 million visitors to Acadia National Park during the 2021 calendar year. Systems could be set up to help monitor and report on traffic and provide various information to visitors about the community, region, current events in the area and advertisements for Passes to Acadia National Park.

The City could also implement a process to notify citizens, or groups of citizens defined by geographic area (or some other criteria) immediately during emergencies, advertise open parking spaces to area drivers and reroute traffic based on traffic flows, weather, or any number of other criteria. These are just a handful of many new applications and services based on the presence of reliable, fast broadband infrastructure.

Lack of robust and affordable broadband in Ellsworth could have the following undesirable impacts on Government, Environment and Transportation:

- Reduce constituent access to municipal services.
- Result in lost opportunities to improve efficiencies and reduce energy consumption.
- Result in lost opportunities for improved traffic management which could provide increased safety and speed of response benefits in emergency situations.

Having robust and affordable broadband in Ellsworth could have the following positive impacts on Government, Environment, Energy and Transportation:

- Allow for the City to stream all municipal meetings online and promote digital inclusion to the entire community.
- Enhance communication and increase civic engagement through increased access to City events such as Council/Board/Committee Board meetings and access to the City's website for information, payments, licenses etc.
- Support efficient utilization of resources, opportunity for expense and labor reduction.
- Provide interconnected transportation and utility systems.
- Provide improvements in the speed and accuracy of analysis, maintenance, and repairs.
- Lay the foundation for Smart City capabilities and applications such as the following:
  - Autonomous vehicles
  - Waste management

- Traffic management
- Public Wi-Fi with pertinent information for visitors and residents
- Data-driven decisions
- Smart lighting
- Smart roads
- Other emerging applications (i.e. The Bar Harbor Chamber of Commerce recently set up an app for economic development/tourism that provides visitors with ideas for local restaurants, lodging, shopping, recreation, etc. This will help encourage economic development as well as ease burdens on the municipal infrastructure, the parks infrastructure, staffing, etc. The National Park Service has a similar app to help manage parking, trail usage, and traffic flows in Acadia National Park.)

Digital Equity, Digital Inclusion & Digital Literacy

Digital equity is defined as a condition in which all individuals and communities have the information technology capacity needed for full participation in our society, democracy, and economy. Digital equity is necessary for civic and cultural participation, employment, lifelong learning, and access to essential services.

Digital inclusion and digital literacy are important components of digital equity. Digital inclusion is the ability of individuals and groups to access and use information and communication technologies. Digital literacy means having the skills you need to live, learn, and work in a society where communication and access to information is increasingly through digital technologies like internet platforms, social media, and mobile devices.

The overall digital equity discussion is an important narrative for the City of Ellsworth to continue to have. The topic of equity in terms of access to broadband has been discussed in several Broadband Committee meetings. If the City were to move forward with a broadband project, the costs of connecting subscribers vary depending on the physical location of the subscriber within the community. In general, the costs of connecting subscribers in the downtown areas of the City will most likely be lower than the costs of connecting subscribers who are further out of the downtown area. When considering a municipal broadband network or project, how the costs of connecting each structure will be paid for needs to be determined. Some constituents will believe that the expensive costs of connecting customers with long driveways, for example, should be borne by the subscriber. Other constituents will believe that the City should pay for all, or a portion of the costs associated with connecting subscribers regardless of where they are located. It is also important for the City to understand the percentage of households that are considered low-income within the community and those who may not be able to budget the cost of current ISP rates.

Digital literacy is a critical issue that must be addressed as well. Consider someone who has a cell phone or device with broadband access who knows how to use social media applications but cannot conduct a job search online or fill out an employment application on a website. The City can address digital literacy issues without implementing a broadband network through organizations such as the National Digital Equity Center (NDEC) based in Machias, Maine.

The National Digital Equity Center advocates for digital inclusion, which includes affordable broadband, affordable equipment, digital literacy, and public computer access. The National

Digital Equity Center is focused on creating digitally literate citizens in the United States and providing communities with the expertise to mobilize broadband technologies through digital inclusion and literacy efforts.

The National Digital Equity Center provides digital literacy classes that provide opportunities for professional growth, personal enrichment, the development of computer skills, and preparation for professional careers. Customized training and consulting solutions are offered to businesses and industries, as well as residents. Online classes are held in a live interactive form using a videoconference platform; in-person classes can be held at community locations in collaboration with partner organizations. The Center provides instruction in a small group interactive learning setting, whether it is online or in-person. To create a digital equity plan, the City could work with the National Digital Equity Center. The organization has funding opportunities to help implement the recommendations/finds of a digital equity plan. In Searsport, Maine, for example, the Broadband Committee has partnered with the National Digital Equity Center to offer in person and online training in a variety of areas including guidance on how to apply for the APC benefit.

Summary of Survey Data Collected

In addition to data gathered through broadband committee and stakeholder meetings, a broadband survey was conducted within the community. This survey ran throughout the majority of November and the entirety of December of 2021 and there was a total of 574 responses as of January 9, 2022. A link to the survey was posted on the City's website, as well as social media pages. A postcard mailing went out to every household and place of business in Ellsworth, providing a link to the survey, notification of a public forum, and informing the public that paper surveys were available at City Hall and the Public Library. A sample copy of the online survey can be found in Appendix D of this report. Additionally, the survey results in graphical format can be viewed at the following URL: https://www.surveymonkey.com/stories/SM-S3Z5GNJQ/

The aggregate data was gathered and compiled identifying the following trends and statistics:

- There were 574 respondents.
- 95% of respondents stated they have internet service.
- Those with internet service have the following ISP:
    - 64% have Spectrum.
    - 30% have Consolidated Communications Inc. (CCI)
    - 2.95% use their cell service for internet access.
    - The remaining 3.15% of respondents had GWI, satellite or did not know.
- 27% of respondents pay between $40 and $60 per month for internet service
- 44% of respondents pay between $60 and $80 per month for internet service.
- 24% of respondents pay over $80 per month for internet service.
- Satisfaction levels with providers broke down as follows:
    - Totally Satisfied = 13%
    - Somewhat satisfied = 49%
    - Somewhat dissatisfied = 25%
    - Totally Dissatisfied = 13%

- 45% of total respondents stated the internet service was too slow.
- 49% of respondents stated their service does not remain stable with multiple users.
- 31% of total respondents stated their service was unreliable.
- 56% of respondents stated their service was too expensive.
- A total of 217 respondents provided speed test results that are broken down below. According to the new Connect Maine definitions of "Least Served" (<25/3) and "Underserved" (< 50/10) more than 50% of the respondents fall into the "Least Served" and "Underserved" categories.
    - Download
        - 1-5 Mbps = 13%
        - 6-10 Mbps = 12%
        - 11-20 Mbps = 13%
        - 21-30 Mbps = 13%
    - Upload
        - 1-5 Mbps = 42%
        - 6-10 Mbps = 14%
        - 11-20 Mbps = 26%
        - 21-30 Mbps = 9%
- 57% of respondents stated there was a better plan available from their provider but the cost was too high.
- Respondents are using their service in the following ways:
    - Online Banking / Taxes / Bills – 90%
    - Research / News – 70%
    - Telecommuting – 57%
    - Telehealth – 36%
    - Small Office / Home Office – 36%
    - K-12 Education – 26%
    - Job Search – 17%
    - Social Service – 16%

- 28% of respondents believe a fair monthly price for internet service is less than $40 per month.
- 54% of respondents believe a fair monthly price for internet service is less between $40 and $60 per month.
- 91% of respondents support a community broadband project to provide 100Mbps download speeds for about $50 per month.

Overview of Bandwidth Utilization within the Internet Industry

Applications will continue to drive higher bandwidth requirements

It was only twenty years ago that a 56 Kbps dialup connection was a common way of connecting to the Internet. Contrast that with the current speed the FCC defines as broadband (25Mbps/3Mbps), and we see that 25Mpbs is 446 times faster than a 56 Kbps connection. A 100Mbps connection is 1,785 times faster than a 56 Kbps dial up connection. There is every reason to believe internet access speeds will continue growing exponentially over the next twenty years. While technologies that use wireless, copper, or satellite for last mile access to subscribers will continue to make advancements in speed and reliability, fiber will continue to outpace these other mediums and offer the best way that is currently known to future proof any network for the speeds that will be needed over the next twenty years.

Historically, internet bandwidth was primarily consumed in a downstream usage model by residential and commercial consumers. Files, emails, and streaming services were downloaded to a user's location or device from the internet and the download speed was traditionally considered more important than the upload speed. Internet usage and bandwidth consumption models have changed with the proliferation of mobile devices as well as real time interactive voice and video services often embedded in social media and other emerging applications. The pandemic of the last two years has exacerbated the need for bandwidth as millions of people have attempted to continue to function in daily life in a remote capacity. These new communication pathways have raised the importance of the upstream speed for all users of internet bandwidth. The FCC's current definition of broadband (25Mbps / 3 Mbps) will not support the current and emerging applications and habits of usage and consumption. Emerging applications and trends bring new pressure on the antiquated definition of broadband by the FCC from both a federal and state level. Some of these applications are described in more detail below.

Video

The amount of video traffic being uploaded and downloaded on the internet is staggering. This video content consists of traditional streaming services like Netflix, Amazon Prime Video and YouTube as well as a plethora of applications that support real time video interaction on traditional and mobile devices like FaceTime, Skype, WebEx, and Zoom. Netflix and YouTube currently account for a very high percentage of traffic on ISP networks. Higher quality digital formats for video continue to emerge and require more bandwidth. 4K streaming is becoming more common and each 4K stream requires up to 25Mbps of bandwidth. The use of two-way real time video services personally and commercially will continue to rise and require increased bandwidth, speeds, and reliability. However, two-way real time video requires symmetrical 25 Mbps (synchronous) bandwidth. Please note symmetrical 25/25 is much higher than the FCC standard of 25/3. Education, telemedicine and telepsychiatry offer promising new alternatives for accessing services and will require robust upload and download speeds to work effectively. This significant uptick in the use of real time video places greater importance on the upload speeds available to businesses and consumers.

Transferring High-Capacity Files

Many businesses who operate partially or fully online require high speed, reliable bandwidth to create and publish high density content to the internet or to store and retrieve this content on corporate or cloud servers. Meetings were held with Broadband Committee members who are within various business sectors who help make up the City's economy. These meetings brought to light several stories from small business owners. One issue outlined was the need to do certain types of their work at home which required the transfer of large files from the business to the internet because the connection at the business was simply not fast enough to do the transfer in a reasonable amount of time.

Cloud

Over the past ten years, many business applications that have traditionally run on a businesses' premise have moved to cloud-based hosting and service models. Software as a Service (SaaS) has become the predominant business model for major application and software providers such as Microsoft (Office365), Google (Gmail, Google Docs etc.) and many other firms. Additionally, there are many options for cloud-based software for traditional business functions and services such as HR, accounting, inventory, and customer service. Cloud services can provide many benefits to businesses and consumers over reliable high-speed Internet connections; however, a robust upload speed is critical for these applications to work reliably.

Residential usage

Residential usage of bandwidth will continue to accelerate at an alarming pace. In addition to all of the residential uses of bandwidth mentioned above, consumers will increasingly use the Internet of Things (IoT) which will allow in-home monitoring of virtually any system as well as video cameras capturing home video footage and storing it in the Cloud. Some studies estimate that as high as 80% of teenagers and young adults watch or participate in online gaming activities. Gaming presents a specific bandwidth challenge because, unlike video traffic, none of the gaming data can be cached, so the amount of real time gaming data that needs to be passed upstream and downstream during a gaming session requires a very robust connection in both directions. Residential use can require broadband for K-12 homework in addition to high school and college online classes.

Emerging Applications and Technologies

Many emerging applications and technologies will require reliable high-speed broadband connections in order to work effectively. Technologies such as Augmented Reality (AR) and Virtual Reality (VR) have the potential to revolutionize teaching and learning models, providing a new level of experiential learning for students from all walks of life. Artificial Intelligence (AI) promises to transform almost every industry, including healthcare (diagnosis, treatments), automotive (autonomous driving), manufacturing (robot assembly), and retail (purchasing assistance). AI technologies are becoming more mainstream and will increasingly be embedded in underlying technologies and systems. Accelerations in the fields of robotics and new technologies like 3D and 4D printing make it clear that some of the technologies being developed will simply

not work on legacy broadband infrastructure in many parts of the country that do not support high-capacity symmetrical services.

Overview of Municipal Network Options

There are many different ways a municipal network can be implemented with a wide range of ownership, operational and financial models. It is important for the City to understand the different models of municipal broadband networks and how each model can be implemented. Three models are outlined below, and each can be reviewed in more detail as the City explores a potential broadband project in the future.

Municipal Owned and Operated Open Access Network

The municipality builds, owns and operates a network and allows service providers to compete and provide services over the network. The municipal level of ownership of the network and assets can vary widely from one community to the next. Each community must determine the extent to which it desires to own and participate in the construction and operation of the ongoing network. Open access networks can be **dark fiber** or active with electronics. In these scenarios there are different ways the network can be architected, managed and supported. The municipality may contract out some or all portions of the network engineering, construction, activation, and operation functions. Municipalities subsidize the cost of the network for the service provider(s) which should offset retail rates of service.

Public / Private Partnership

The municipality partners with an existing service provider or with multiple service providers to build a network and provide services on the network. Municipalities subsidize the cost of the network for the service provider(s) which provides greater incentive for the service provider(s) to invest since they can achieve their return on investment (ROI) far sooner than if they had borne the entire cost of the build out or expansion. In the Public-Private-Partnership (PPP) model both the municipality and private partner(s)/service provider(s), enter into a legal partnership and share the risks and rewards of the network deployment. An example of a type of PPP would be a partnership with an existing ISP in the community, who would build or expand that ISP's broadband infrastructure to meet the needs of the community. Recently, more and more municipalities are exploring establishing a PPP for deploying and operating last-mile networks. There are many different types of PPPs.

Blended Municipal Network

A blended municipal network is when a municipality owns and operates zones or regions of the network. Existing and/or other service provider(s) will provide their own coverage areas within the city limits. In this model the municipality may choose to build out fiber infrastructure within a certain geography within the community. For example, this scenario could play out for the purpose of ensuring that K-12 students in low-income housing within the community have access to broadband for educational purposes. The municipality may also choose to partner with a service

provider to build or expand broadband infrastructure to achieve a specific purpose within the community such as Smart City infrastructure.

Risks

The risks outlined below will vary based on the type of municipal network option that is considered and potentially implemented by the City of Ellsworth. Therefore, each risk and level of risk will be evaluated and outlined for the broadband network models as the City's broadband network project moves forward and more data is collected.

Financial Risks

A decision to move forward with an investment to improve broadband in the Ellsworth community will require a strong commitment to the project by the City, the community, and the project stakeholders. Funding of any broadband improvement network project involves risk, and all variables must be properly evaluated and include the commitment and engagement of the community.

There are a variety of funding sources that must be explored, including all of the following:

- Bond issuance;
- Debt financing (including government-based lending institutions like the USDA Rural Utility Service);
- Federal and State Grants and broadband funding bills currently approved and in motion;
- Public-private partnerships; and
- Private investment.

Survey data indicates the majority of the respondents (95%) currently subscribe to some sort of Internet service already. The 2020 US Census data shows there are 3,585 households in the community. According to the survey statistics gathered, this indicates that 3,406 are paying for internet service currently and are paying an average monthly cost of $50. This translates to $170,287 per month or $2,043,450 per year, currently being spent by the community on internet service. This is a strong indication of the demand and current subscription rate for broadband, and there would appear to be enough recurring revenue available from this demand within the Ellsworth community to support a municipal effort and investment to improve broadband.

Although broadband subscription rates are high, a City owned, and operated broadband network would compete with existing service providers and a competitive analysis would need to be performed and studied to determine if this is a viable path. A complete and detailed financial analysis should be included in the City plans to gain a firm understanding of costs, funding sources, take rates and revenues over a set period of time to determine the feasibility of the project(s) size and options.

Operational Risks

With any municipal effort to improve the broadband network, there is no guarantee of success. For example, the ongoing operation of a municipal owned and operated broadband network is complex

and requires many skills and functions not common in most municipalities, such as specific broadband related customer service, installation and repair, network engineering and construction. The City should not rely on the old approach of "if we build it, they will come." Firm customer adoption levels (take-rates) must be determined to develop actionable financial and operational models. The planning and development of the precise broadband expansion routes and targeted geographic area within the city must be prioritized based on **take-rates** and costs to maximize recurring revenue streams.

Operational risks can be lessened and shared if a municipality enters into a PPP. Partnering with an existing provider, maximizing the existing infrastructure, skills and operational functions can be leveraged to support the increased coverage base.

Partnership Risks

The building and operation of a broadband network is a complex task, requiring specialized skills. Selecting the right partner(s) to participate in the project will be critical to the success of the project. How well the partner(s) provide customer service should be of critical importance in this process. Thirty-eight percent of survey respondents who have internet service stated they were somewhat or totally satisfied with the service they were currently receiving. If the City were to enter into a partnership, in addition to maintaining levels of service and costs set by the City, the partner(s) must execute on the construction and operational agreements and meet expected timelines. Contracts must be negotiated in a way that allows the City to hold some leverage over partners regarding committed timelines and Service Level Agreements (SLA).

Public Relations Risks

If the City chooses to participate in efforts to improve the broadband network by investing in the construction of a network that could compete with private enterprise, this may cause some controversy within the community and with existing ISPs. Looking at examples in other communities, there is potential opposition to the idea from residents, businesses and existing service providers and ISP's. Involving the community and key stakeholders from the beginning lends transparency which is important in order to gain public trust in the process. Thus far, the City of Ellsworth has engaged the public and key stakeholders in this process, and these efforts must continue as the potential project moves forward.

Competitive Risks

There are several risks that come from the existing competitive landscape. As stated earlier, over 95% of residence and business are customers of existing internet providers. It is not certain if any of the existing providers would be interested in a Public-Private Partnership. If the City were to determine that the best course of action would be to invest in a new municipal owned network, the competition to migrate customers would need to be assessed.

The competitive risk from the wireless 5G expansion is not fully known. There is much industry debate that 5G will solve the broadband issue in the immediate future. The technology is in its infancy in terms of deployment and requires a high number of small cell radios deployed within each square mile in order to achieve consistent high symmetrical speeds with low latency. 5G will

likely evolve to become a more robust mechanism for broadband access but the timeframe for that is unknown.

Fixed Wireless Access continues to be a lower cost technology option for reaching rural subscribers and the addition of some of the unlicensed **CBRS** spectrum increases the capabilities and reach of wireless solutions. Although wireless has had a difficult time competing with fiber and other access methods in Maine, the increasing capabilities of radio systems in serving subscribers should not be discounted as a potential source of competition.

Low earth orbit (LEO) satellite service continues to evolve, and the best-known version of this new technology is the SpaceX / StarLink venture by Elon Musk. A recent report indicates the network appears to be underwhelming subscribers as more users are added to the network. Although high speeds are being realized in some locations, new users are experiencing significantly long delays in getting onto the network. The final network may consist of over 12,000 satellites, and at this point in time, the network is in its infancy.

Cable operators are working to increase upload and download speed capacity on their existing **HFC** networks. In some cases, in responses to RFP's, we are seeing cable operators propose **FTTP EPON** roll outs in new areas of communities where they are not currently providing service. We also know from communication with one of the operators that they have partnered with a hardware company to add components to their legacy **HFC** network in order to achieve symmetrical speeds approaching 10Gbps.

Fiber will continue to outpace wireless technologies, including 5G, in terms of capacity and scalability for the foreseeable future. Cellular plans have traditionally been expensive for unlimited access, and it is unlikely that will change with 5G. It is also interesting to note that the small cell technology of 5G requires many more cells per square mile, each of which needs fiber connectivity.

Risks of doing nothing

There are risks in doing nothing and letting market forces decide the future. It is unlikely an existing service provider is going to overbuild the City of Ellsworth without some sort of financial incentive and assistance on either a federal, state, or local level. The current broadband issue throughout the country is a result of inadequate return on investment (ROI) for providers to expand their networks.

State and federal definitions for broadband even 18 months ago considered Ellsworth to be fairly well served. As State and Federal definitions of broadband continue to change it is clear that there is going to be a lot of competition for grant dollars and funds to assist communities in building or expanding broadband networks. Communities that are active with broadband projects will be much better positioned to chart the course of the future of broadband for their community.

Without improved broadband, businesses and residents may choose to relocate to other communities with superior broadband over time. Potential businesses or new residents may choose not to move to Ellsworth due to lack of affordable and robust broadband options. Additionally, there could be lost opportunities for improvement of services and cost reduction in all the sector areas addressed earlier in this plan.

Roadmap Next Steps

The City of Ellsworth is well positioned to continue to explore the feasibility of implementing a community wide municipal broadband fiber network. The outline below highlights additional steps in this process that need to be conducted in order to continue to move this evaluation forward.

- Present Broadband Strategic Plan and Roadmap to City's Broadband Committee.
- Make final draft of Broadband Strategic Plan and Roadmap available for public comment.
- Present Broadband Strategic Plan and Roadmap to City Council.
- Review and update overall goals and priorities of City:
  - Fiber based ubiquitous network to all residents and businesses.
  - Focus on specific areas regarding affordable and adequate broadband services.
  - Finalize bandwidth requirements.
  - Build consensus around issues of digital equity and access.
  - Select network model(s).
  - Expansion of City's private network and evaluation of Smart City functions.
  - Timeline for each step and overall broadband project.
  - Affordability for low-income households.
- Determine engineering and mapping efforts needed for data collection of existing utility infrastructure and of existing structures. Conduct engineering and mapping efforts to identify existing broadband infrastructure and gaps. Data will be used in developing a comprehensive RFP for selected network models.
- Review and identify network models (allow for all, or eliminate one or more, as determined by City stakeholders):
  - City owned and operated.
  - City owned with private contracted operator.
  - Private owner and operator.
- Administer a comprehensive Request for Proposal (RFP) to determine broadband design (network model), service providers, **CapEx** and **OpEx**. Multiple RFP's may be used depending on the broadband network model(s) chosen by the City.
- Develop a complete and detailed financial analysis to gain a firm understanding of costs, funding sources, take rates and revenues over a set period of time to determine the feasibility of the project(s) size and options.
- Develop financial and operational models to support goals and priorities of broadband expansion.

- Review and identify additional risks per network model from data collected.
- Negotiate Build-Out/Operational/Financial Models.
- Approval by Voters if Necessary.
- Implement Network Strategic Plan.

Conclusion

The next generation of broadband is here. Mission Broadband deems high speed reliable broadband a key component for long-term community success, and this finding has been echoed in Ellsworth by the community. Many communities across America are developing a path to a sustainable robust broadband future by evaluating and determining a network model which best suits their needs, to include, building, owning, and operating a broadband network. Ellsworth has positioned itself as "*the heart of Downeast Maine providing professional, recreational, cultural, and retail services for nearly 60,000 people in the Hancock and Washington County area. Incorporated into our logo is the slogan, 'Business, Leisure, Life' and these three words speak volumes to the business opportunities, the business-friendly atmosphere, and the quality of life and place in our community."* A well thought out broadband plan is a continuation of Ellsworth's vision of today and the future.

The next steps outlined in this Plan are for the City to continue their evaluation of the feasibility of a robust broadband network for all residents and businesses. The guiding principles of accessibility and affordability used in the workgroup session and the forum will continue to be used throughout the decision-making process. Ownership and partnering network models will need to be decided by evaluating what is in the best interest of the City regarding **CapEx, OpEx**, service levels, affordability, sustainability, etc. Infrastructure engineering and a comprehensive Request for Proposal process will feed financial models to aid in the City's decision making.

As is recommended in this Plan, the City should continue efforts of transparent communication regarding ongoing status to the City's constituents. The City's team has organized and communicated to businesses and residents this broadband effort and have been a key contributor with opening communication paths to the public. Communication will be an important factor as the City's broadband project moves along.

The continued growth of internet-based applications will place more need on a sustainable robust broadband network for all communities. Ellsworth's realization of this fact and their willingness to be proactive in the process, will prove beneficial for the City. Mission Broadband believes the roadmap outlined, combined with the City's proven commitment will result in a successful broadband future for the City of Ellsworth.

Appendix A: Glossary

3G: The term for the 3rd generation wireless telecommunications standards usually with network speeds of less than1 Mbps.

4G: The term for 4th generation wireless telecommunications standards usually with network speeds greater than 1 Mbps.

5G: The term for emerging 5th generation wireless telecommunications standards usually associated with network speeds of up to 1 Gbps or more.

A

Asymmetrical or Asynchronous Bandwidth: A connection in which the maximum transfer rate is different for download and upload speeds.

Augmented Reality (AR): a technology that superimposes a computer-generated image on a user's view of the real world, thus providing a composite view.

B

Backbone: A major high-speed transmission line that strategically links smaller high-speed Internet networks across the globe.

Backhaul: The portion of a broadband network in which the local access or end user point is linked to the main Internet network.

Bandwidth: The capacity of an internet connection.

Bond: A fixed-income security in which a borrower borrows money from an investor for a specified period of time at fixed or variable interest rate.

Broadband: The term broadband commonly refers to high-speed Internet access that is always on and faster than traditional dial-up access. Broadband includes several high-speed transmission technologies, such as fiber, wireless, satellite, digital subscriber line and cable. For the Federal Communications Commission (FCC), broadband capability requires consumers to have access to actual download speeds of at least 25 Mbps and actual upload speeds of at least 3 Mbps.

C

CapEx (Capital Expenditures): funds used by a company to acquire, upgrade, and maintain physical assets such as property, plants, buildings, technology, or equipment. CapEx is often used to undertake new projects or investments by a company.

CBRS (Citizens Broadband Radio Service): CBRS is a band of radio-frequency spectrum from 3.5GHz to 3.7GHz that the Federal Communications Commission has designated for sharing among three tiers of users: incumbent users, priority licensees and generally authorized, which is lightly licensed.

Appendix A: Glossary (continued)

Central Office: A telecommunication company's building where consumers' phone lines are attached to equipment that connects a consumer to other consumers in that central office or other central offices across the globe.

Community Anchor Institutions: Schools, libraries, medical and healthcare providers, public safety entities, institutes of higher education and other community support organizations that provide outreach, access, equipment, and support services to facilitate greater use of broadband service by the entire population and local governments.

Community Needs Assessment: An assessment of the deficiencies that exist in a community that are preventing it from reaching goals or desired results relating to broadband

Connect Maine: The Connect Maine Authority is a public instrumentality of Maine state government whose mission is to facilitate the universal availability of broadband to all Maine households and businesses and help them understand the valuable role it can play in enriching their lives and helping their communities thrive.

D

Dark Fiber: Fiber that is in place but not being used for broadband services. ("non-lit" fiber, also see "Lit Fiber").

Digital Divide: The gap between those of a populace that have access to affordable Internet and other communications technologies and those that have limited or no access.

Digital Equity: Recognizes that digital access and skills are now required for full participation in many aspects of society and the economy. Digital Equity links Digital Inclusion to social justice and highlights that a lack of access and/or skills can further isolate individuals and communities from a broad range of opportunities.

Digital Inclusion: Implies that individuals and communities have access to robust broadband connections; Internet enabled devices that meet their needs; and the skills to explore, create and collaborate in the digital world.

Digital Literacy: The ability to leverage current technologies, such as smartphones and laptops, and Internet access to perform research, create content, and interact with the world.

Digital Skills: Any skills related to operating digital devices or taking advantage of digital resources.

DOCSIS (Data Over Cable System Interface Specification): The international telecommunications standard for cable signaling data and spectrum sharing.

Download speed: The rate at which data is transferred from the Internet to the user's computer.

DSL (Digital Subscriber Line): A form of technology that utilizes a two-wire copper telephone line to allow users to simultaneously connect to and operate the Internet and the telephone network without disrupting either connection.

Appendix A: Glossary (continued)

E

EPON: The 10 Gbit/s Ethernet Passive Optical Network standard, better known as 10G-EPON allows computer network connections over telecommunication provider infrastructure. The standard supports two configurations: symmetric, operating at 10 Gbit/s data rate in both directions, and asymmetric, operating at 10 Gbit/s in the downstream (provider to customer) direction and 1 Gbit/s in the upstream direction. It was ratified as IEEE 802.3av standard in 2009. EPON is a type of passive optical network, which is a point-to-multipoint network using passive fiber-optic splitters rather than powered devices for fan-out from hub to customers.

F

Fiber (Also referred to as Fiber Strand): A flexible hair-thin glass or plastic strand that is capable of transmitting large amounts of data at high transfer rates as pulses or waves of light.

FTTH or FTTP (Fiber to the Home or Fiber to the Premise): The delivery and connection of fiber optics directly to a home or building.

Fixed Wireless Access: The use of wireless devices/systems in connecting two fixed locations, such as offices or homes. The connections occur through the air, rather than through fiber, resulting in a less expensive alternative to a fiber connection.

G

Grant: A legal instrument reflecting a relationship between a government agency and a recipient. The main purpose of the relationship is to dispense money or resources in order to accomplish a public purpose. No substantial involvement is anticipated by the government agency during the recipient's completion of the activity.

H

HFC (Hybrid Fiber Coax): A communications network type (typically a cable TV network) that uses a combination of optical fibers and coaxial cable. The fiber provides the high-speed backbone, and the coax is used to connect end users to the backbone.

Homework Gap: The homework gap refers to the difficulty students experience completing homework when they lack internet access at home, compared to those who have access.

I

Internet of Things (IoT): The Internet of things (IoT) is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifiers (UIDs) and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction.

Appendix A: Glossary (continued)

Internet Service Provider (ISP) or also referred to as just Service Provider: A company that provides users (individuals or businesses) with access (a connection) to the Internet and related services.

Interconnection: The linking of numerous telecommunications networks to exchange user traffic.

Last Mile: The technology and process of connecting the end customer's home or business to the local network provider.

Lit Fiber: An active fiber optic cable capable of transmitting data.

Local Area Network (LAN): A group of network devices that are on a high-speed connection and typically within the same building or location.

LTE (Long Term Evolution): A 4G wireless broadband technology that provides speeds up to 100 Mbps download and 30 Mbps upload.

M

Maine School and Library Network (MSLN): The Maine School and Library Network provides internet access, email, web hosting, and other internet related services to almost 1000 schools and libraries across the state of Maine.

Middle Mile: The connection between a local network, also called a "last mile" connection, and the backbone Internet network.

N

Network Infrastructure: The hardware and software components of a network that provide network connectivity and allow the network to function.

O

Open Access Network: Networks that offer wholesale access to network infrastructure or services provided on fair and reasonable terms with some degree of transparency and nondiscrimination.

OpEx (Operational Expenditures): ongoing cost for running a product, business, or system.

P

Point of Presence: The particular place or facility where local Internet service providers connect to other networks. Distance from the Point of Presence can affect service availability and pricing.

R

Rights-of-Way (ROW): ROW are legal rights to pass through property owned by another. ROW is frequently used to secure access to land for digging trenches, deploying fiber, constructing towers, and deploying equipment on existing towers and utility poles.

Appendix A: Glossary (continued)

S

Service Area: The entire area within which a service provider either offers or intends to offer broadband service.

Smart City: A community which uses different types of electronic internet of things (IoT) sensors to collect data and then uses insights gained from this data collection to manage assets, resources and services efficiently.

Smart City Functions: Types of features that could be enabled with Smart City technologies:

- Traffic Monitoring
- Smart Cameras
- Parking meters that advertise open parking spaces to drivers
- Ability to access and provide structural data to emergency responders
- Real time monitoring of air quality, water levels, critical utilities
- Autonomous driving

Spectrum: A conceptual tool used to organize and map the physical phenomena of electromagnetic waves. These waves propagate through space at different radio frequencies, and the set of all possible frequencies is called the electromagnetic spectrum.

Symmetric/Synchronous bandwidth: an internet service with the same upload and download speeds.

T

Take-Rate: the percentage of potential subscribers who are offered a service that actually do subscribe to the service.

Tax Increment Financing: A public financing method through which future property tax increases can be diverted to subsidize community development and improvement projects.

Tier 1 Internet Network: A network of Internet providers that form a superhighway that allows users access to every other network on the Internet.

Tier 2 Internet Network: A network of smaller Internet providers that allow users to reach some portion of the Internet but that still purchase IP transit.

Telemedicine: The use of high-speed, high-capacity Internet to support long-distance healthcare services, patient and provider education and enhanced healthcare administration.

Upload speed: The upload speed is the rate that data is transferred from the user's computer to the Internet.

Appendix A: Glossary (continued)

V

Virtual Reality (VR): The computer-generated simulation of a three-dimensional image or environment that can be interacted with in a seemingly real or physical way by a person using special electronic equipment, such as a helmet with a screen inside or gloves fitted with sensors.

VoIP (Voice over Internet Protocol): A technology that allows users to send and receive voice calls using an Internet connection instead of a traditional phone line.

W

Wi-Fi (Wireless Fidelity): A technology that uses radio transmissions to enable electronic devices to connect to a wireless local area network (LAN).

WISP: An ISP that provides service through a wireless network.

Appendix B: Broadband Survey Postcard (Front/Back)

Ellsworth Broadband Survey

The City of Ellsworth Broadband Committee has developed a survey to collect information on residential and commercial internet connectivity. The data from this **confidential** survey will be used to better understand the needs of our community.

Please complete the survey online using the link below before December 31, 2021:

www.surveymonkey.com/r/ELLSWORTH_BB

Paper copies are available at City Hall and the Public Library.

The Broadband Committee will also hold a public forum on November 10, 2021 from 4:00 to 6:00 PM in the Council Chambers at City Hall to answer questions and hear comment on potential broadband expansion in the City.

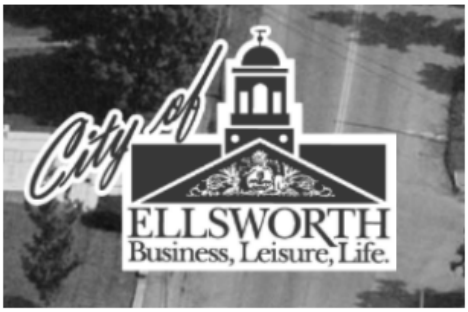
Your input is essential in planning for potential broadband expansion in Ellsworth.

If you have questions or would like to obtain more information please call 207-669-6655.

Appendix B: Online Survey

Link to Online Survey Results: https://www.surveymonkey.com/results/SM-M9JWW3BR7/

Instructions: Please fill out one survey for each location you are referencing (i.e., if you own a business, please fill out a separate survey for that location).



Ellsworth Broadband Survey

Ellsworth Broadband Survey

The City of Ellsworth Broadband Committee has developed and is distributing this survey in order to collect information on residential and commercial internet connectivity in the City. All names and addresses will be kept confidential and the data will be summarized to understand the needs of our community. Your input is essential in planning for potential broadband expansion in the City.

THANK YOU FOR YOUR TIME!

1. Please provide your address including street name and number within the City of Ellsworth.

Address Number

Street Name

* 2. Do you have access to internet service at your household?

- Yes
- No

Ellsworth Broadband Survey

Ellsworth Broadband Survey

* 3. If you do not have internet access at this location, why not?

- Internet service is not available
- Internet service is not affordable
- Other (please specify)

* 4. Number of K-12 Students at this location?

- 0
- 1
- 2
- 3
- 4
- 5 or more

* 5. Number of potential internet users at this location?

- 0
- 1
- 2
- 3
- 4
- 5 or more

Ellsworth Broadband Survey

Ellsworth Broadband Survey

* 6. If you had internet access at this location, what functions would you perform over the internet from your household? (Please select all that apply and press <OK> when done.)

- [ ] Telecommuting / Work from home
- [ ] K-12 Education
- [ ] Post Secondary Education
- [ ] Tele-Health / Tele-Medicine
- [ ] Small Office / Home Office (SOHO)
- [ ] Entertainment
- [ ] Shopping / Ordering Items
- [ ] Social Media to include email
- [ ] Research / News Feeds
- [ ] Social Services
- [ ] Online Banking / Tax Filing / Insurance / Paying Bills
- [ ] Secure VPN (Virtual Private Network)
- [ ] Job Searching

Other (please specify)

* 7. What do you believe is a fair monthly price for a reliable 100Mbps internet service?

- ( ) less than $40 per month
- ( ) $40 to $59 per month
- ( ) $60 to $80 per month
- ( ) over $80 per month

* 8. If a community broadband project were undertaken to provide 100Mbs download speeds for about $50/mo., would you purchase the service?

- ( ) Yes
- ( ) No

Ellsworth Broadband Survey

* 9. Who is your internet service provider?

- Spectrum / Charter
- Consolidated Communications (CCI)
- Cellular Service / Hot Spot
- GWI (Fiber Optic)
- Satellite (HughesNet or ViaSat)
- RedZone Wireless
- I don't know

* 10. What do you currently pay for internet service each month? (If your service is bundled with voice or video, please list only the cost of the internet portion of the service.)

- less than $40 per month
- $40 to $59 per month
- $60 to $80 per month
- over $80 per month

* 11. How satisfied are you with your internet service?

- Totally Satisfied
- Somewhat Satisfied
- Somewhat Dissatisfied
- Totally Dissatisfied

Ellsworth Broadband Survey

* 12. Does your internet service remain stable and reliable when multiple people are using the service at the same time?

- Yes
- No

* 13. If you are not satisfied with your internet service, why not? (Please check all that apply and press <OK> when done.)

- [ ] Too slow
- [ ] Unreliable service
- [ ] Too many outages
- [ ] Poor Customer Support
- [ ] Too expensive
- [ ] Not Applicable

14. Please perform a speed test and enter the results below. A speed test measures the upload and download speeds of your service. You can run a speed test by going to the following URL in a separate browser and clicking on the "GO" button: www.speedtest.net

	1 to 5 Mbps	6 to 10 Mbps	11 to 20 Mbps	21 to 30 Mbps	31 to 50 Mbps	51 to 100 Mbps	Greater than 100 Mbps
Download Speed (Mbps)							
Upload Speed (Mbps)							

15. Is a higher speed plan available from your current provider or another provider but the cost is too high?

- Yes
- No

Ellsworth Broadband Survey

Ellsworth Broadband Survey

* 16. What functions do you need to perform over the internet from your household? (Please select all that apply and press <OK> when done.)

- [ ] Telecommuting / Work from home
- [ ] K-12 Education
- [ ] Post Secondary Education
- [ ] Tele-Health / Tele-Medicine
- [ ] Small Office / Home Office (SOHO)
- [ ] Entertainment
- [ ] Shopping / Ordering Items
- [ ] Social Media to include email
- [ ] Research / News Feeds
- [ ] Social Services
- [ ] Online Banking / Tax Filing / Insurance / Paying Bills
- [ ] Secure VPN (Virtual Private Network)
- [ ] Job Searching

Other (please specify)

Ellsworth Broadband Survey

* 17. Of the functions listed below, which ones tend to be the most challenging to use with your current internet service? (Please select all that apply and press <OK> when done.)

- [ ] Telecommuting / Work from home
- [ ] K-12 Education
- [ ] Post Secondary Education
- [ ] Tele-Health / Tele-Medicine
- [ ] Small Office / Home Office (SOHO)
- [ ] Entertainment
- [ ] Shopping / Ordering Items
- [ ] Social Media to include email
- [ ] Research / News Feeds
- [ ] Social Services
- [ ] Online Banking / Tax Filing / Insurance / Paying Bills
- [ ] Secure VPN (Virtual Private Network)
- [ ] Job Searching
- [ ] All functions work.

Other (please specify)

18. How many people use the internet service to work remotely?

- ( ) 0
- ( ) 1
- ( ) 2
- ( ) 3 or more

19. How many K-12 students need to rely on the service for remote education?

- ( ) 0
- ( ) 1
- ( ) 2
- ( ) 3 or more

Ellsworth Broadband Survey

20. How many people use the internet service for telehealth and telemedicine services?

- 0
- 1
- 2
- 3 or more

* 21. What do you believe is a fair monthly price for a reliable 100Mbps internet service?

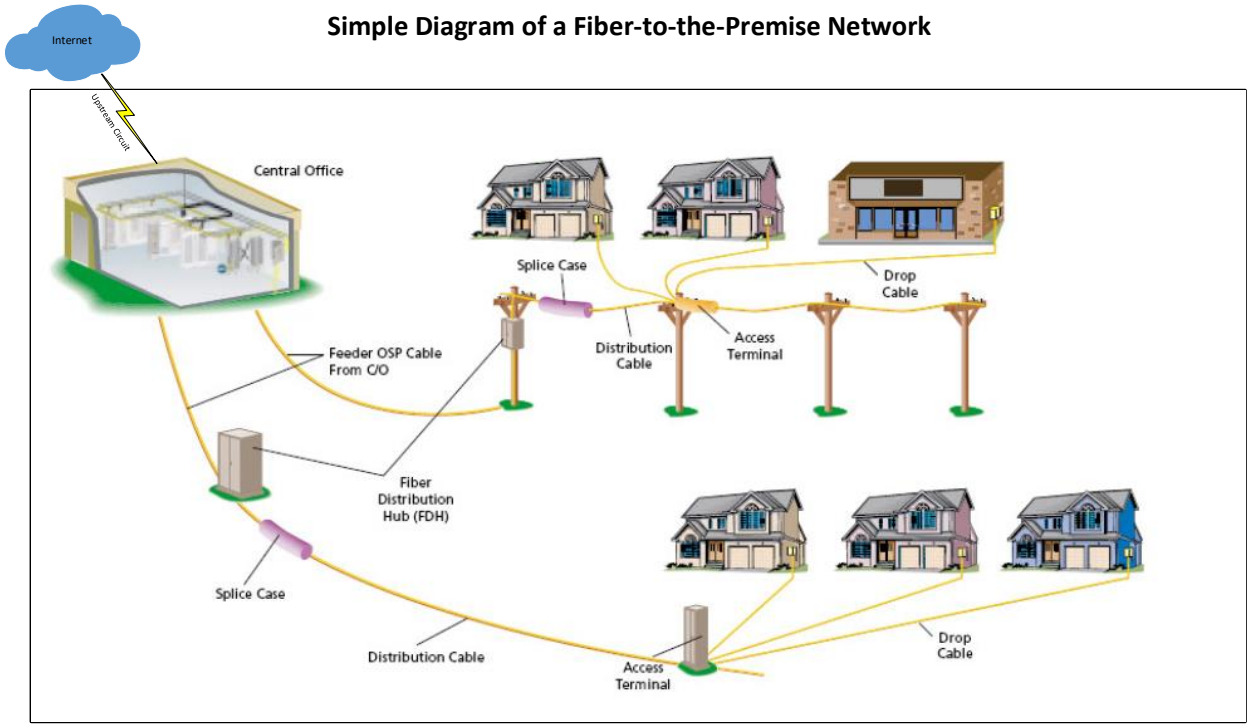
- less than $40 per month
- $40 to $59 per month
- $60 to $80 per month
- over $80 per month

* 22. If a community broadband project were undertaken to provide 100Mbs download speeds for about $50/mo., would you purchase the service?

- Yes
- No

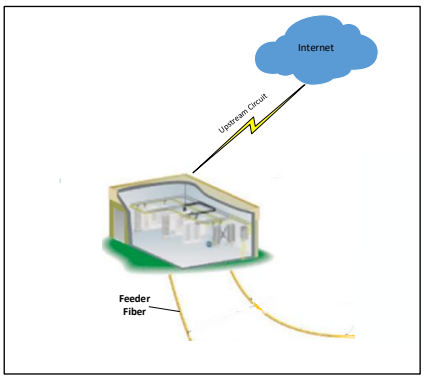
Appendix C: Network Diagrams - Fiber-to-the-Premise Components

Simple Diagram of a Fiber-to-the-Premise Network



Appendix C: Network Diagrams – Central Office

Network Components – Central Office

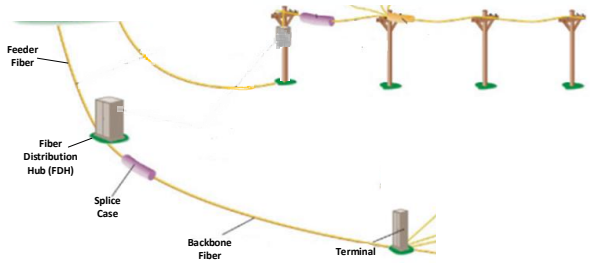


Central Office

* Fiber runs from the Central Office along telephone poles to customer homes.
* In the Central Office the fiber plugs into equipment to provide services to customers.
* The Central Office has a large upstream circuit to the Internet.
* Someone has to pay for all of the components of the Central Office and ongoing maintenance.

Appendix C: Network Diagrams – Fiber Backbone

Network Components – Fiber Backbone



Fiber Backbone

* Fiber runs from the Central Office along the telephone poles throughout a town or region.

* There are other pieces of equipment included in the backbone such as terminals and hubs. All of this backbone fiber is used to connect the individual customer locations back to the Central Office.

* Someone has pay for the backbone and for the costs to maintain, expand and repair as time goes on.

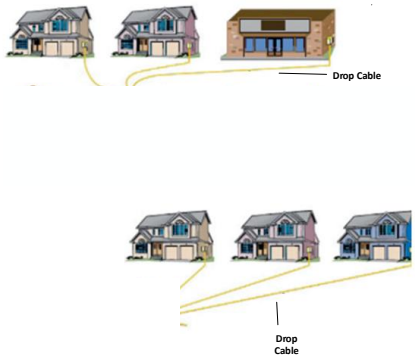
Appendix C: Network Diagrams – Customer Location

Network Components – Customer Location

Customer Location

* Drops are fiber cables from the street cable to the inside or side of a customer location.

* The costs vary depending on the distance of the drop and whether or not the cable needs to be buried anywhere on the property.

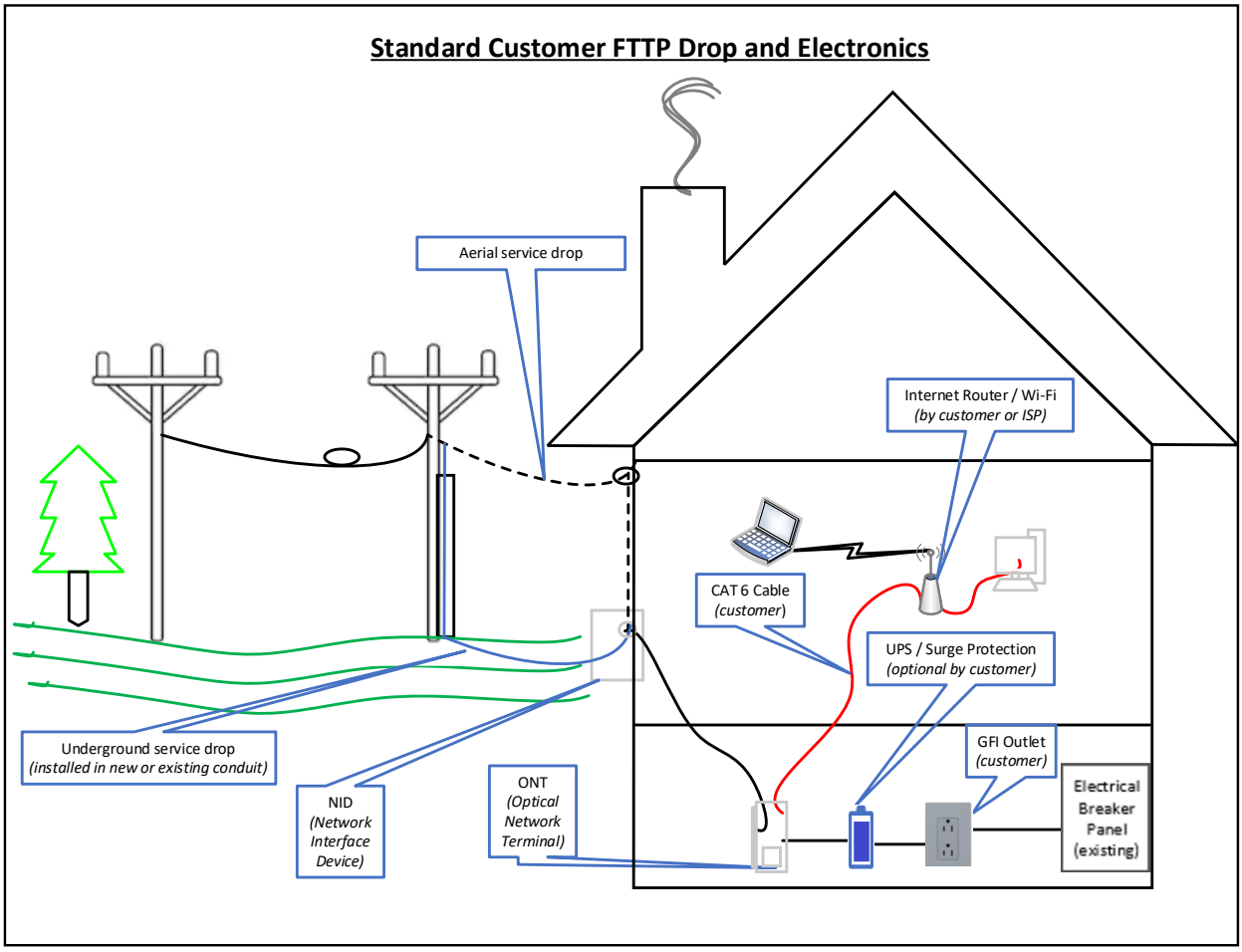


Customer Location (cont.)

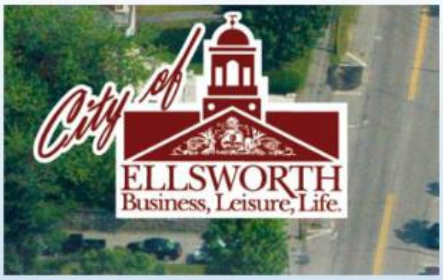
* The fiber is connected to a device that provides the Internet service to the customer. Often times this equipment will provide Wi-Fi service for the customer as well.

* Someone has to pay for the cost of the drop and the equipment that goes into a customer location.

Appendix C: Network Diagrams: Standard Fiber Drop and Electronics



Appendix D: Municipal Broadband Public Forum



Municipal Broadband Public Forum

November 10, 2021

AGENDA

- Introductions / Ground Rules (Parking lot for open items)
- Glossary
- Municipal Broadband Network Overview
- How would a robust, affordable municipal broadband network, or lack thereof, impact the City of Ellsworth in the following areas: Education, Healthcare, Public Safety, Economic Development, Local Government, non-profits?
- Questions / Feedback
- Next Steps

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Introductions

- City of Ellsworth Participants
- Mission Broadband Role and Participants
- Housekeeping Items (including directions on questions/answers)

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Glossary

- **Internet Service Provider:** The term Internet service provider (ISP) refers to a company that provides access to the Internet to both personal and business customers.
- **Municipal Broadband Network:** This is a network within a municipality that was constructed with some level of funding or bonding by the municipality. The City or Town has ownership in the network. This may involve a partnership with other public or private entities.
- **Network Operator:** In municipal networks, a network operator is the company that operates and provides maintenance for the network. In some cases, this is a different organization than the ISP(s) providing services on the network.
- **Take Rate**: In the case of municipal broadband networks, one measure of "success" is defined as the level of "take rate" (i.e., *the percentage of potential subscribers who are offered the service that actually do subscribe)*. So, if there are 1,000 potential customers in a community and 45% of them sign up for the municipal broadband service, then there would be 450 subscribers to start. Financial models assume certain take rates in their projections.
- A **Request for Proposal (RFP)** is a business document that announces a project, describes it, and solicits bids from qualified contractors to complete it. Most organizations prefer to launch their projects using RFPs, and many governments always use them.

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Glossary

- **Network Backbone** – the fiber cables that are strung on the poles throughout the community comprise the network backbone.
- **Drop** – the drop is a cable that connects from the backbone network on the poles to the customer structure. The drop cable attaches to equipment that is installed inside the structure.
- **Public-Private Partnerships** involve collaboration between a government agency and a private-sector company that can be used to finance, build, and operate projects, such as municipal broadband networks.
- **Served, Unserved and Underserved:** A household is considered served by FCC definitions if the household has access to 25/3 Mbps. Anything less than that is considered underserved. A house with no options for internet service is unserved.
- **Grants and Served, Unserved and Under-served:** Eligibility for federal and state grants has traditionally relied on definitions and data about unserved and underserved households in a geographic area. Definitions and rules around eligibility are still evolving and minimum broadband speed definitions are changing at the state and federal level which is great news.

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Municipal Broadband Network Overview

Municipal Broadband Network - a broadband network built in a community to provide Internet Access to residents, businesses and organizations. These networks are owned or subsidized in part or fully by the municipality.

- **Municipal Owned Open Access Network** – the municipality builds a network and allows all Service Providers to compete and provide services over the network. Open access networks can be dark fiber or active with electronics. In these scenarios there are different ways the network can be managed and supported. Municipalities subsidize the cost of the network for the Service Provider(s) which should offset retail rates of service.
- **Public / Private Partnership** – the municipality partners with an existing service provider or with multiple service providers to build a network and provide services on the network. Municipalities subsidize the cost of the network for the Service Provider(s) which should offset retail rates of service.
- **Blended Municipal Network** – Municipality will own and operate zones or regions of the network. Existing and/or other service provider(s) will provide their own coverage areas within the city limits.

Survey Statistics

A community broadband survey was recently launched. Below is a summary of the initial results:

- 125 responses total; 96% of respondents have internet; 4% of respondents do not have internet primarily because it is not available.
- 67% have Spectrum; 28% have Consolidated Communications;
- Roughly 40% of respondents were 'somewhat' or 'totally' dissatisfied with their internet service primarily because the service was too slow and too expensive.
- 47% of respondents stated their service does not remain stable and reliable when multiple people are using the service at the same time.
- 40% of respondents had a download speed of less than 20Mbps
- Roughly 69% of respondents had an upload speed of less than 20Mbps.
- 57% of respondents had other options for service but considered the costs too high to switch.

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How is your internet service being used?

ANSWER CHOICES	RESPONSES
Telecommuting / Work from home	63.44%
K-12 Education	44.09%
Post Secondary Education	21.51%
Tele-Health / Tele-Medicine	27.96%
Small Office / Home Office (SOHO)	33.33%
Entertainment	88.17%
Shopping / Ordering Items	90.32%
Social Media to include email	90.32%
Research / News Feeds	64.52%
Social Services	19.35%
Online Banking / Tax Filing / Insurance / Paying Bills	94.62%
Post-Secondary Education	0.00%
Secure VPN (Virtual Private Network)	31.18%
Job Searching	17.20%

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Public Input

- How would a robust, affordable broadband network impact the City of Ellsworth in the following areas:
  - Economic Development
  - Healthcare
  - Education
  - Public Safety
  - Local Government
  - Non-profits

Public Input

- How would lack of a robust, affordable broadband network impact the City of Ellsworth in the following areas:
  - Economic Development
  - Healthcare
  - Education
  - Public Safety
  - Local Government
  - Non-profits

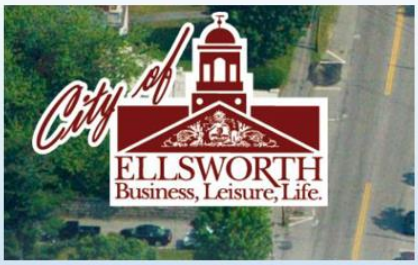
Municipal Broadband Network Summit

Questions / Feedback

Thank You!

Next Steps

- Follow up stakeholder meetings as necessary
- Public survey currently being conducted:
  - https://www.surveymonkey.com/r/ELLSWORTH_BB
- Finalize Roadmap



Municipal Broadband Network Summit

Thank you for your participation!!!!

Appendix E: National Digital Equity Center Presentation

National Digital Equity Center

Goal: To close the Digital Divide across Maine and the United States

1

What is Digital Equity and Digital Inclusion?

Definition: Digital Equity is a condition in which all individuals and communities have the information technology capacity needed for full participation in our society, democracy and economy.

Digital Equity is necessary for civic and cultural participation, employment, lifelong learning, and access to essential services.

Definition: Digital Inclusion includes:

- Affordable Broadband
- Affordable Equipment
- Digital Literacy Training
- Public Computer Access

Digital Equity & Digital Inclusion Plans

- Affordable Broadband
- Affordable Equipment
- Digital Literacy
- Public Computer Access
- Community Advocates
- Broadband Adoption

3

Affordable Broadband

Is there a plan for low -to-moderate income families that cannot afford an internet connection?

4

Affordable Equipment

Is there a plan to identify community members that need equipment – laptops, desktops, tablets, etc.?

5

Digital Literacy

- Possesses the variety of technical skills required to find, understand, evaluate, create, and communicate digital information in a wide variety of formats;
- Is able to use diverse technologies appropriately and effectively to retrieve information, interpret results, and judge the quality of that information;
- Understands the relationship between technology, lifelong learning, personal privacy, and stewardship of information;
- Uses these skills and the appropriate technology to communicate and collaborate with peers, colleagues, family, and on occasion, the general public; and
- Uses these skills to actively participate in civic society and contribute to a vibrant, informed, and engaged community

6

People are most interested in training that will help them stream video content and use Microsoft Office along with business products, such as QuickBooks.

- Streaming video content online (Netflix, Hulu, Sports channels, etc.) 94%
- Using tools to be productive in home or business (Word, Excel, QuickBooks) 91%
- Basic knowledge of computer and the internet, including internet safety 79%
- Connecting to family and friends (Zoom, Skype, FaceTime, WiFi calling) 67%
- Using Social Media (FaceBook, Twitter, Instagram, etc.) 37%

7

Public Computer Access

Is there Public WiFi?
Are there places like libraries and adult education locations that have computers available for public use?

8

Community Advocates

Are there community volunteers that can promote digital inclusion efforts?

9

Broadband Adoption

What is the community's "take -rate"?
Do all homes have a computer?

10

Ellsworth, Maine Statistics

# of Households	Has a computer	Has a broadband connection
3,491	3,068	2,600
Family Median Income	Less than $25,000	
$55,191	814	23%

11

National Digital Equity Center Resources

Digital Equity & Digital Inclusion Plans

Free Digital Literacy Classes
- For Work & Business
- Aging Well with Technology
- For Home & Education

Free devices for low -to-moderate income individuals

Partner Affiliate Onsite Program

Volunteer Program

12

National Digital Equity Center Statistics

- 67% of students are 50-years and older, 27% are 70-years old and older, 8% are 80 years old and older!
- 41% of students have a high-school diploma or less
- 28% of students are unemployed
- 34% of students are retired
- 48% of students have a family median income of $34,999 or less

13

Measuring Outcomes

Economic Opportunity:

- Does digital literacy training increase workforce skills training which increase employability?
- Does it improve job seeking skills and create a more highly skilled, job ready workforce?
- Does it increase access to educational attainment?

Aging-in-Place:

- Can older adults remain in their homes as they grow older with the use of technology tools?
- Can it reduce isolation and loneliness?
- Does the use of technology (telehealth) improve health outcomes?

14

National Digital Equity Center

For more info:

www.digitalequitycenter.org
info@digitalequitycenter.org
207-259-5010

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