

**Town of Bowdoin
Community Technology Plan**

Submitted by:

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Table of Contents

- I. **Executive Summary**
- II. **Study Background and Structure**
- III. **Technology- Fiber**
- IV. **Final Thoughts**
- V. **Appendix A**
 - Digital Inclusion Plan
- VI. **Appendix B**
 - Grant Funding Resources
- VII. **Addendum:**
 - Addendum 1: Town of Bowdoin Business Survey Results
 - Addendum 2: Town of Bowdoin Community Survey Results
 - Addendum 3: Broadband Opportunity Council Report

Executive Summary

The community of Bowdoin found itself in an unenviable position of having:

- Poor cable service and poor internet connectivity through the cable provider
- Areas only served by DSL that is inconsistent and unreliable
- A significant number of homes that are unserved

The community came together to address these issues with an impressive group of local citizens and town officials. Over time, the Bowdoin Broadband Committee had focused on working with Comcast to enhance and expand service. Prior to the ConnectME Community Planning Grant, the Broadband Committee had obtained a good amount of information on Comcast plans and cost to increase and expand service. However, the talks with Comcast had stalled and the Committee was looking to work through a planning grant to increase its options.

A survey yielded 245 responses, a significant number considering the size of the town. Some of the responses are below:

“We have no internet at our home, so my children have to go to my Mom’s to do their homework”

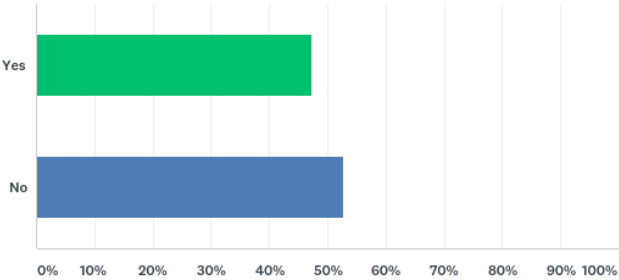
“Hurry up and get Comcast to extend their lines to the rest of Bowdoin. DSL is worthless”

“I currently have to use my cellular phone plan Wi-Fi for internet”

“We have tried to get internet service through many different companies, and none of them would bring service”

Given some of the responses, it was not surprising to have almost 53% answer they were not happy with their current internet service....

Q11 Overall, are you happy with your current Internet service?



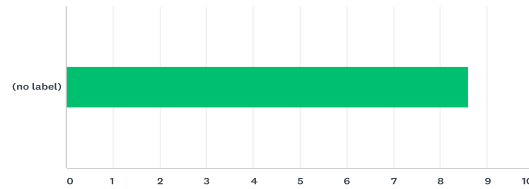
And when asked how important the internet was on a scale of 1 to 10....

Bowdoin Community Internet Survey

SurveyMonkey

Q22 On a scale of 1 to 10, 1 being no important and 10 being extremely important, how important is it for the town to pursue options to expand and upgrade internet service? (select one)

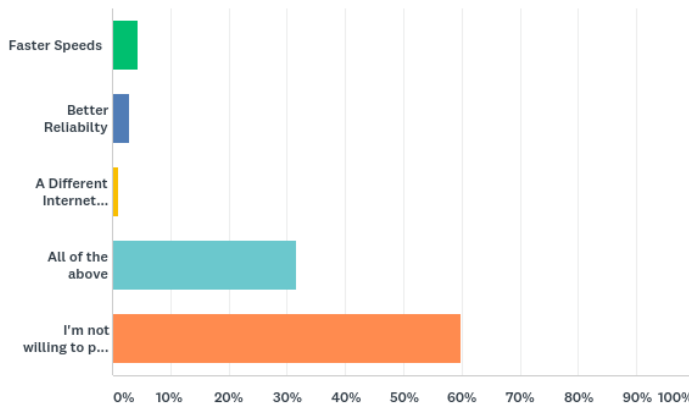
Answered: 225 Skipped: 22



| | 1- NOT IMPORTANT | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10- EXTREMELY IMPORTANT | TOTAL | WEIGHTE AVERAGE |
|------------|------------------|-------|-------|-------|-------|-------|-------|--------|--------|-------------------------|-------|-----------------|
| (no label) | 1.78% | 0.00% | 0.00% | 0.89% | 7.56% | 3.11% | 8.00% | 16.44% | 12.89% | 49.33% | 225 | 8.5 |
| | 4 | 0 | 0 | 2 | 17 | 7 | 18 | 37 | 29 | 111 | | |

However, the community was very price sensitive, when asked if they would pay more for a variety of choices, including higher speeds, better reliability and a competitive internet provider... 60% said they would not pay more.

Q10 Would you be interested in paying more for one of the following? (select one)

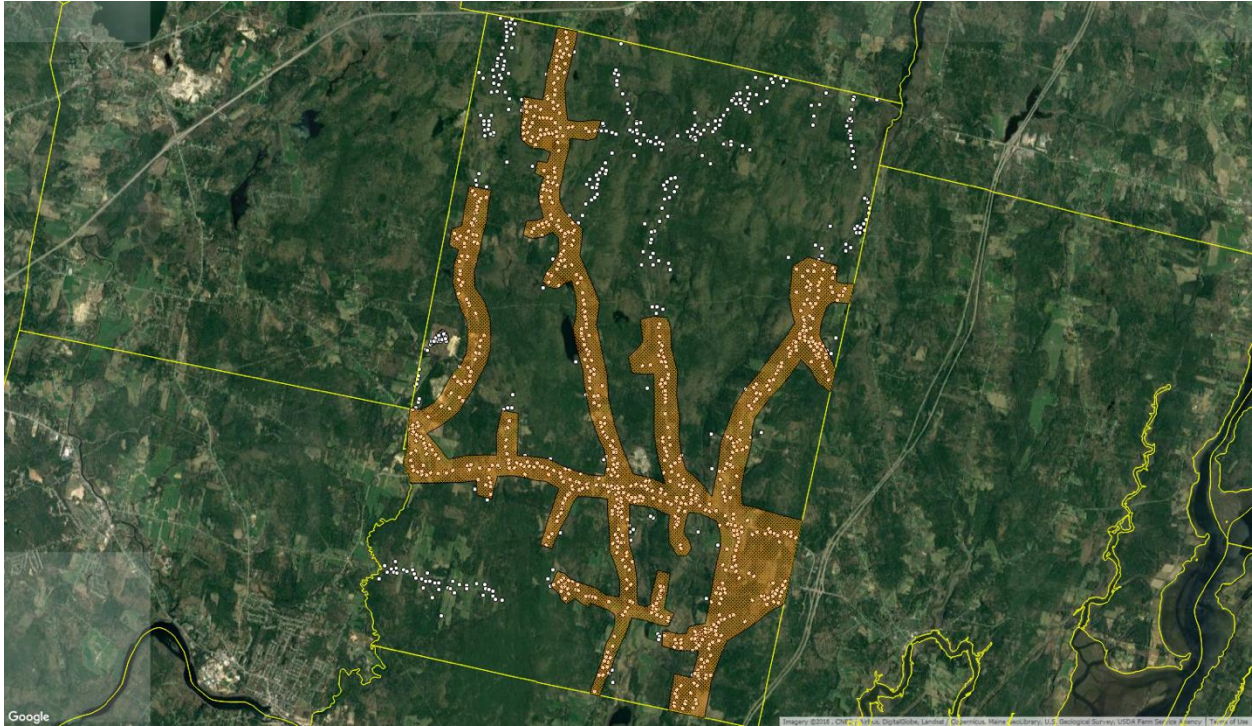


Comcast

Our approach strongly favors working with Comcast to help the town expand broadband. They are the incumbent cable and internet provider already well established in a good part of the community and had previously hinted at potential upgrades to their current coverage area.

During the planning, Comcast did an engineering study of Bowdoin and concluded that they would upgrade their current technology, and at the time, also indicated that the “numbers looked good” to expand service to all homes in Bowdoin. Axiom believed our work was complete and that together we were able to move Comcast to a decision with no cost to the town. After this announcement, we confirmed that Comcast remained committed and was planning on upgrading their cable equipment

in the first Quarter of 2018 but would not be applying for a ConnectME grant and would “evaluate” the promise of expansion to all of Bowdoin, “in April or May”.



Comcast Coverage Area

As part of the ongoing conversation, the community has begun to engage Comcast to renew their Franchise Agreement that we advised be tied to their expansion into all areas of the community. As you can determine from the map above, there are large areas of the community that do not have Comcast coverage.

Franchise Agreements

In our planning work across the state, several communities have asked Axiom on how to handle negotiations with Spectrum, the other cable provider in the state. We have not had any experience with engaging Comcast. However, we would advocate a similar approach with either Spectrum or Comcast.

Most communities focus on the % of revenue returned to the community, but there are several other aspects to the Franchise Agreement that can be negotiated. Be advised that these are just suggestions and that some of them have come from what other communities have asked and received.

Recommendations:

Generally, we would like to see communities get more out of their agreements because these are typically for long periods of time, some up to 15 years or more, it seems that thoughtful discussions need to take place with an eye on a future where none of the participants today may be around for the next discussion or to understand or enforce the negotiated agreement during its term, so having a well-documented negotiation is important for future.

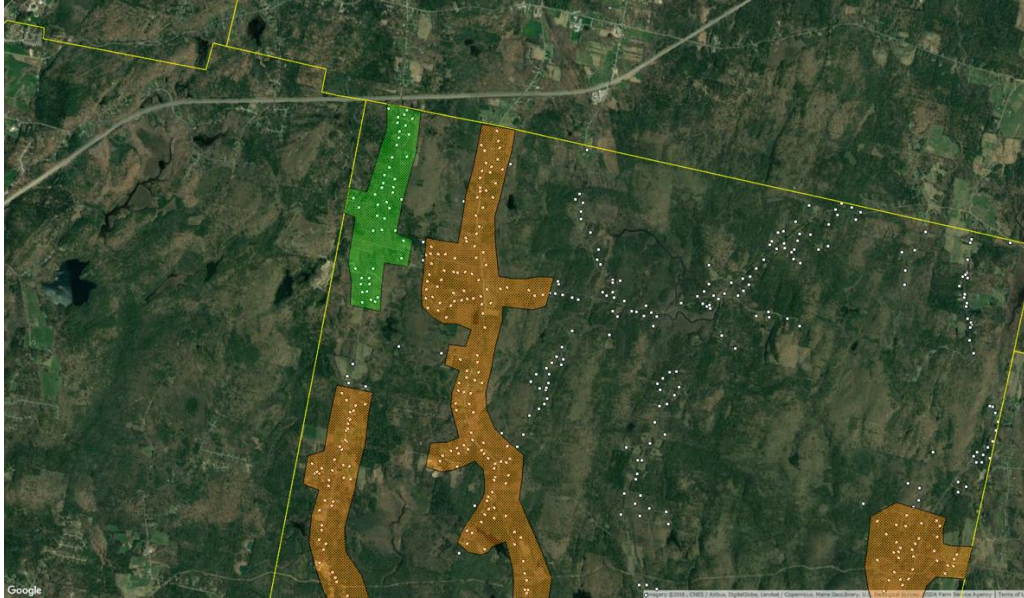
Below are some “Can do” and “Cannot do” for you to think about:

| Can do | Cannot Do |
|--|---|
| <i>Can require specific cable system capacity and functionality</i> | <i>Cannot require a specific transmission technology</i> |
| <i>Can require support of PEG (Public, Educational and Government) access through facilities, equipment and channels.</i> | <i>Cannot specify which channels are or are not carried and cannot specify which channels are on which tier of service (other than PEG service)</i> |
| <i>Can establish customer service standards, including ones related to answering telephone calls, responses to complaints, and imposing of late fees.</i> | <i>Cannot regulate rates (other than lowest cost tier of service)</i> |
| <i>Through an enabling ordinance can require a specific definition of gross revenue</i> | <i>Cannot require franchise fees of more than 5% of gross revenue, as defined in the franchise agreement (see dispute w/ Fairfield below)</i> |
| <i>Can regulate the video portion of services offered</i> | <i>Cannot regulate any voice (telephone) services</i> |
| <i>Can require construction of an Institutional Network (I-Net) linking schools, libraries and public buildings for voice, video and data communications (South Portland did this)</i> | <i>Cannot grant an exclusive franchise</i> |
| <i>For the public access channel, can require a specific location</i> | <i>Cannot regulate data services, including Internet services</i> |
| <i>When a cable company does construction in public rights of way, can specify that it must do so in a manner that does not disrupt those rights of way unreasonably.</i> | |

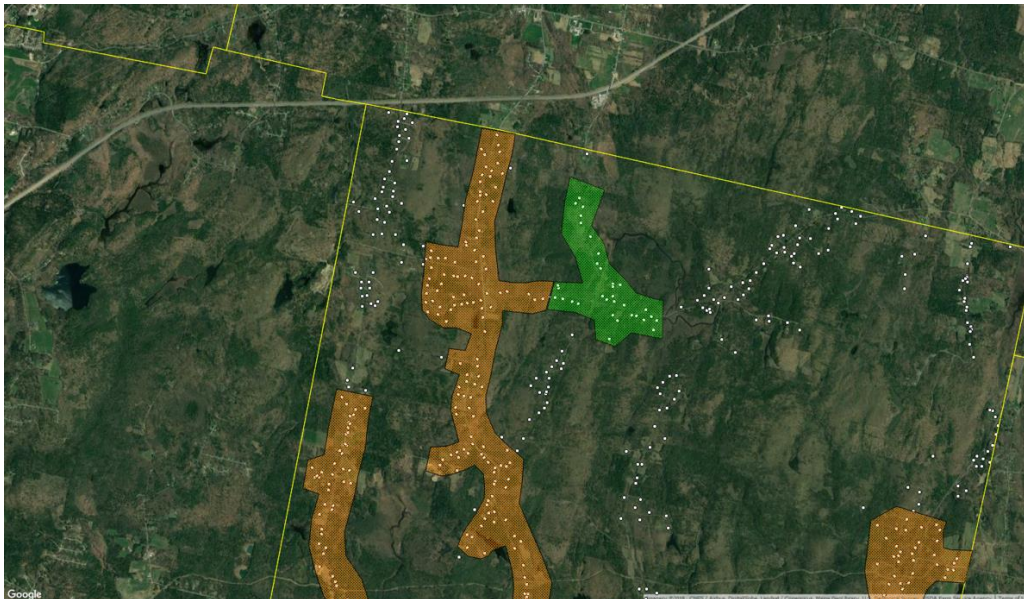
- ❖ *South Portland did negotiate an I-Net connecting all of its public building*
- ❖ *Fairfield sued then TWC for franchise fees not paid, not sure how that dispute ended:*
 - <http://www.centralmaine.com/2015/08/20/fairfield-says-time-warner-owes-it-353000/>
- ❖ *The State of Maine created a Model Franchise Agreement that you can access*
<http://www.maine.gov/connectme/about/modelcable.shtml>

One additional suggestion would be to negotiate extending service in lieu of franchise fees or using franchise fees to help defray the cost of extended service to marginal areas (those with less than 20 homes per mile). This was already requested, and several maps of areas we believed were available to expand were never responded to.

Three potential expansion areas for Comcast:



Area #1 – Approx. 2 miles of road coverage that can potentially reach 42 addresses in the 911 database.



Area #2 – Approx. 1.8 miles of road coverage that can potentially reach 32 homes in the 911 database.



Area #3 – Approx. 1.3 miles of road coverage that can reach 32 homes in the 911 database, this segment is contingent on Area #2 expansion. There is a potential of 64 homes reached within 3.2 miles.

These are all areas the Broadband Committee or town officials can point to as the most populated areas that meet or nearly meet the criteria for Comcast to expand.

You also might consider working with Comcast to use franchise fees as part of the match for an extension of service through the ConnectME Authority Infrastructure grant application process. However, those areas that would be served must be considered unserved, meaning connectivity of less than 1.5Mbps. This was suggested to Comcast and they are aware of this state program. Perhaps by early 2019, a productive partnership could be forged that would allow for an application to be developed and submitted. A ConnectME grant requires a 1 to 1 match, either paid for by the town (in lieu of franchise fees for a specified amount of time) or by the provider. Previously, the company has been open to this grant opportunity.

Consolidated Communications

Because of the configuration of the community in relationship to Consolidated Communication's Remote Terminal and/or Central Office (terms to indicate where their DSL equipment is), and because of the nature of Consolidated Communication's service, we were not encouraged about Consolidated investing in upgraded equipment or expanding into unserved or underserved areas. A recent conversation with Consolidated Communications confirmed what the Broadband Committee already knows, that they understand that there are unserved areas, mainly in the Northwestern area of the community, and they did not answer the question if they had any plans to expand into those unserved areas. Consolidated Communications does have federal money from the Connect America Fund that will expand or enhance service to 36,000 homes in Maine. However, as we indicated, we are not aware of Consolidated Communications' plans to expand service into Bowdoin to serve areas currently unserved or served poorly by their current equipment. Consolidated Communications was a second option that had the potential to expand service at no cost to the town. Consolidated Communications' recent software upgrades and changes in personnel make it difficult to obtain a confidential map of their current coverage area, and one was not acquired for this report.

Two other options

We explored two other options for possible deployment to the unserved areas. Fiber Optics and Fixed Wireless. Both are viable options however, only fiber would meet the goals of the town and wireless was quickly dismissed because a guarantee to serve every unserved home is not something that a wireless solution could promise. Ultimately, a Fiber to the Premise solution was developed for this report that would serve every home in Bowdoin.

Fiber Optics

- Fastest technology available on the market today
- Very reliable and stable
- Enough capacity to handle almost unlimited data transfer, making streaming and gaming, cloud services and a host of online applications run easily
- Scalable, as demand for more bandwidth increases, a fiber system can handle connections of up to a Gig (1000Mbps) per home... if ever needed

While fiber optic systems are expensive, these systems offer the best in future proof scalability, blazingly fast symmetrical service and unrivaled reliability.

There are a couple of other real concerns, one adds significant costs and the other is the reluctance of another provider to operate and maintain a fiber system, given the real possibility that Comcast would at some time in the future expand service and compete for the limited customers that are not served now.

We did look at what it would cost to run fiber from the 3 Ring Binder to Bowdoin (approximately 6 miles, at \$25,000 per mile= \$150,000) that would bring open access fiber into the community. While this approach could bring additional internet service provider options to the community, we favor a bulk purchase of fiber in the community itself, avoiding the complication and cost of hooking into the Three Ring Binder.

The overall plan for fiber will be discussed fully in another section, but at a price tag of \$3.6M we would encourage the community to work closely with Comcast to explore all options for expanded service.

Study Background and Structure

Axiom was invited to interview with the Bowdoin Broadband Committee in 2017 to discuss their current state of internet connectivity in the community. As one of only a handful of communities in Maine that is served by Comcast, they felt like an outlier from other towns that were served by Spectrum. During that discussion, it was clear that there was a frustration with Comcast because they had not upgraded their cable systems and that communication had broken down. In addition, a section of Bowdoin was completely unserved by either Comcast or Consolidated Communications. Many on the Broadband Committee live in those areas that do not currently have service and are relying on a variety of connection methods that include cellular hotspots, Mi-Fi devices and satellite service. All were unsatisfied.

The committee described a series of inquiries and conversations with the current incumbent carrier and their lack of transparency and willingness to invest in the community.

It was in this context that Axiom was asked to create a plan to serve Bowdoin by focusing on two things:

- Attempt to engage Comcast to:
 - Upgrade their cable system
 - Expand their footprint into other areas
- Create an alternative plan for the community if Comcast expansion did not occur

The Committee was open to other solutions and was relying on Axiom’s expertise to help better understand all of their options. Below is the Axiom Rural Broadband Assessment and Deployment Kit that we used to guide the community through a process that would help them reach their goals and ultimately implement a project.



1 Assess- Evaluate community needs and determine leverage-able assets

Before Axiom makes any recommendation to a community, we do a thorough investigation of the assets that are in the community that could be leveraged.

- Meetings with current service providers to determine if these assets can be leveraged
- Investigation of current Broadband infrastructure
 - Location of fiber-optics
 - Locations of towers that might serve the community with wireless technology
- Review of any community barriers
 - Right of way laws
 - Moratoriums or height restrictions

2 Define Goals- Collaborate with leadership and citizens to define needs and goals

Through a series of meetings with community, business and civic organization leaders as well as strong community input, define what the community specifically wants to achieve and begin to define roadmap to achieve goals.

- Form a Broadband committee made up of diverse group of town/city/regional officials and community leaders
- Reach out to community with a survey to understand community concerns, cost of current service and where it might be lacking
- Business surveys and meetings- work with Broadband group to identify key businesses for interviews and identify larger list of businesses through Chamber or other organizations to send a business specific survey

3 Plan- Develop the strategic and tactical plan for community

Once goals are defined, develop a gap analysis that describes what the community has for existing assets that can be leveraged, articulates the goals of the community and defines what needs to occur to reach their goal through a step by step roadmap that can become part of a communities' Comprehensive Plan.

- Develop gap analysis
- Road map that can be implemented over time in phases, or all at once
- Identify resources to help community be ready for implementation
- Discuss private-public partnerships and other implementation models

4 Implement- Execute rural broadband deployment plan

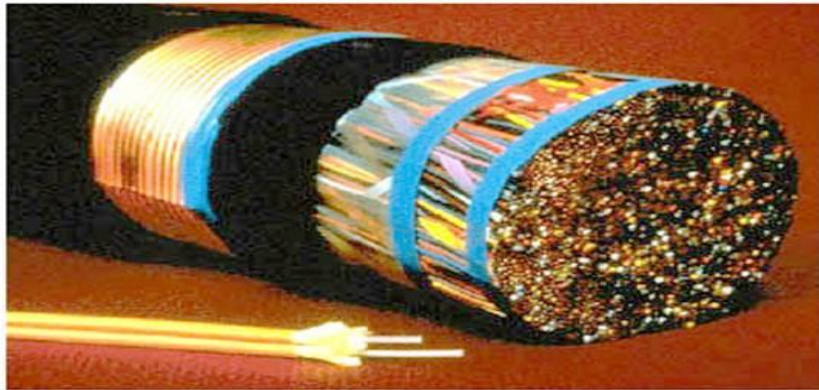
Work with the provider to execute a clearly defined public-private partnership that spells out each party's role and responsibility.

- Determine build out timeline to complete project
- Negotiate a revenue sharing model and ownership of network
- Hire local citizen to assist Axiom with customer relations/installations and technical service questions

This project follows the first 3 steps of the Rural Deployment BB Process and recommendations on implementation. For more information on Steps 5-7, please contact Axiom.

Technology- Fiber

Fiber technology is the gold standard for internet connections and is a technology many communities strive to achieve because of its many positive attributes. One of the major concerns with fiber systems is the up-front cost. However, over time, other technologies would need to be replaced, upgraded or will be deemed obsolete. On the other hand, fiber will allow you to scale the bandwidth delivered as needed, all while using the same fiber distribution network over a period of decades.



The optical fiber cable in the foreground has the equivalent capacity of the copper cable in the background.

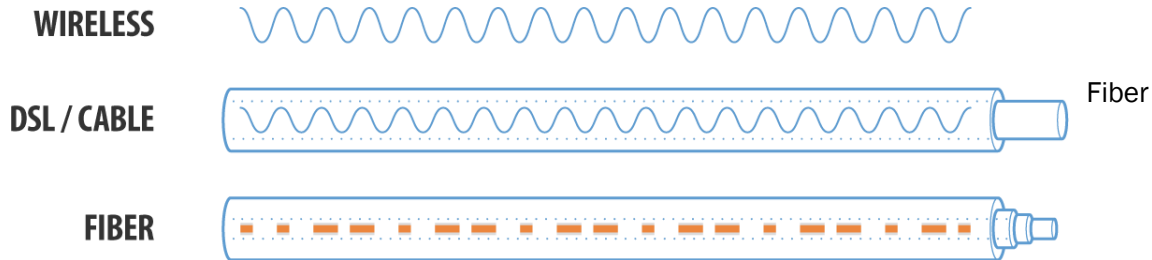
Just one visual example will underscore the capabilities of a fiber connection versus a legacy copper network connection. With today's technology, one fiber the thickness of a human hair can carry more data than 4,000 top-speed DSL lines.

Homes that are being served by copper, either through DSL from the phone company, or with co-ax from the cable company, have serious limitations in service because of how each technology works. In the case of DSL, not only is the driving technology outdated, but also the old copper lines themselves are susceptible to corrosion that can severely impact the reliability of the connection. Furthermore, DSL is severely limited in the distance it can push a signal (3 miles maximum), meaning that those homes furthest from the telco equipment are faced with connections that often cannot reach even a paltry 3Mbps download speed.

In the case of coaxial cable (co-ax), used by TV cable providers, capacity is still an issue, but for different reasons than with DSL. Compared to a fiber-optic system, cable is not nearly so scalable – for every step up in speeds, equipment needs to be upgraded both at the home and at the cable plant. Furthermore, cable systems were designed primarily to push data down to the customer, a significantly different model than the emerging needs for telecommuting and interactive video, which require high bandwidth in both directions. Finally, there is a major concern with the fact that cable is a shared system, meaning that the signal strength you receive is dependent on how much bandwidth is being drawn by other users that are also connected to that line of cable. Cable companies commonly oversaturate their subscriber networks by a ratio of up to 100:1, leading to inconsistent speeds for the end user.

Naturally, questions arise about the capabilities of each technology and these differences should be carefully considered when building a network. We firmly believe that the benefits of having fiber connections to your homes – are worthy of consideration, even with the cost associated with fiber. Please consider this section something that can be used by community to help citizens understand the benefits of a fiber network, while weighing the cost against those benefits over time.

How it works is the secret to higher speeds

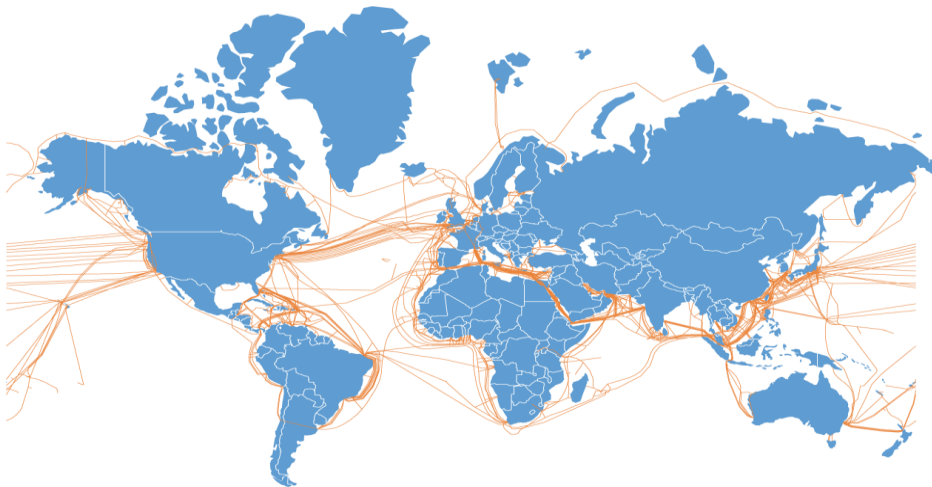


“Broadband” describes the fastest method of delivering high-speed internet to subscribers. While DSL and cable utilize existing phone and TV infrastructure to transmit data as frequency “vibrations” over copper wires, fiber networks transmit data using light over specialized cables that contain glass fiber strands. Light moves at 186,000 miles per second, and this is what enables speeds of 1 Gig (1000Mbps) or much more per connection- 100 times faster than a 10Mbps DSL connection and 10 times faster than a 100Mbps cable connection. In addition, both DSL and cable suffer from the limits of their own technology, making them less than ideal choices into the future.

Wireless is an interesting choice and is certainly being considered in major urban markets where the density of buildings makes fiber optic cabling expensive and complicated. Wireless service, while reliable, is not as reliable as fiber optics and can be susceptible to weather conditions and movement of outdoor equipment due to wind. Wireless also requires a direct line of sight; obstructions are not a friend of a wireless signal. While it has the capability to be as fast as fiber, reliability concerns and reliance on line of sight make wireless installations best suited to very dense urban, or certain rural situations where the physical environment allows for reliable, high speed wireless systems, where costs make wireless a serious consideration.

Like other technology- is it going to become obsolete?

While we cannot predict the future, all indications are that fiber optics is here to stay for a very long time. Frankly, this technology has already been used for many, many years, which means that there are trillions of dollars of fiber installed globally. A whole industry has grown up around how to utilize fiber to its fullest capacity to make all of our lives better. This industry has proven very good at developing new electronics to push more and more data through existing fiber lines.

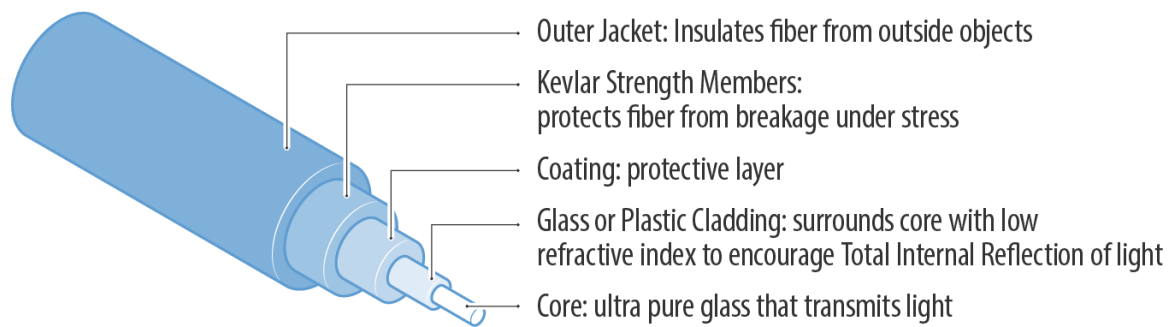


Most people think of fiber as a new technology but, in reality, it has been used for “backbone” connectivity as far back as the 80s, with hundreds of fiber optic cables running across the sea floor all around the world.

What is new, is that fiber is starting to be used to serve homes in places like Austin and Chattanooga and right her in Maine on the islands of Islesboro and Cranberry Isles, where FTTH (Fiber to the Home) networks are being deployed. Because of the extensive network of fiber already deployed and continuing to be deployed, it is very unlikely that we would see any major shift in market forces that would make fiber optics obsolete. Most telecom observers believe that 5G cellular technology is many years away from possibly replacing even a traditional DSL or cable connection.

What is in a fiber-optic cable?

An individual optical fiber (the size of a human hair) is surrounded by several layers of material that strengthen and protect the fiber. A fiber-optic cable can have any number of “fibers” ranging from 1 to several 100s.



Benefits of Fiber Technology

Speed and Capacity. Many experts say that FTTH connections are the only technology with enough bandwidth to support the projected consumer demands over the next decade.

Future proof. Because of fiber’s capabilities, new technological innovations are being invented every day to utilize fiber’s superior ability to transport tremendous amounts of data at blazingly fast speeds. Technologies such as 3D holographic high-definition television and gaming will someday be everyday items in households around the world. FTTH will be able handle the estimated 30 gigabit-per-second needs of such equipment... and this is just one technology. Think about the new ways that you use the internet that seem commonplace now that were not even conceived of 10 years ago.

One delivery system. Right now, a consumer can receive telephone, video, audio, television and almost any type of data transmission using a single seamless FTTH connection. That trend will continue as consumers are given increasing array of a la carte choices for how they receive their various communication and data and streaming choices. Subscribers are also realizing that receiving bundled services through a fiber connection can save money.

Reliability. Fiber is the most reliable connection you can have. In surveys across the state of Maine, the #1 complaint is reliability. An internet connection is becoming a necessity, not a luxury. When connectivity is interrupted or slowed down unexpectedly or inexplicably, consumers are furious that they cannot accomplish the on-line task, leading to a significant loss of productivity or time.

Direct benefits to Communities

Job Creation- There are many examples of fiber networks creating jobs by either supporting existing businesses or attracting new ones

Business Attraction- When we say business attraction, we really mean businesses that are looking for the kinds of connections that can move large amounts of data, quickly- architects, designers, banks and other heavy users

Entrepreneurship- Fiber helps induce young people to locate and work from anywhere

Telemedicine- The medical field and how patients and providers interact is undergoing seismic changes. One of those changes is the way patients are able to be seen, treated, monitored and are increasingly being given tools to manage their own health care, right from their home. A fiber connection has the capacity to manage these data transmission uses, which in turn facilitates our elders aging in place

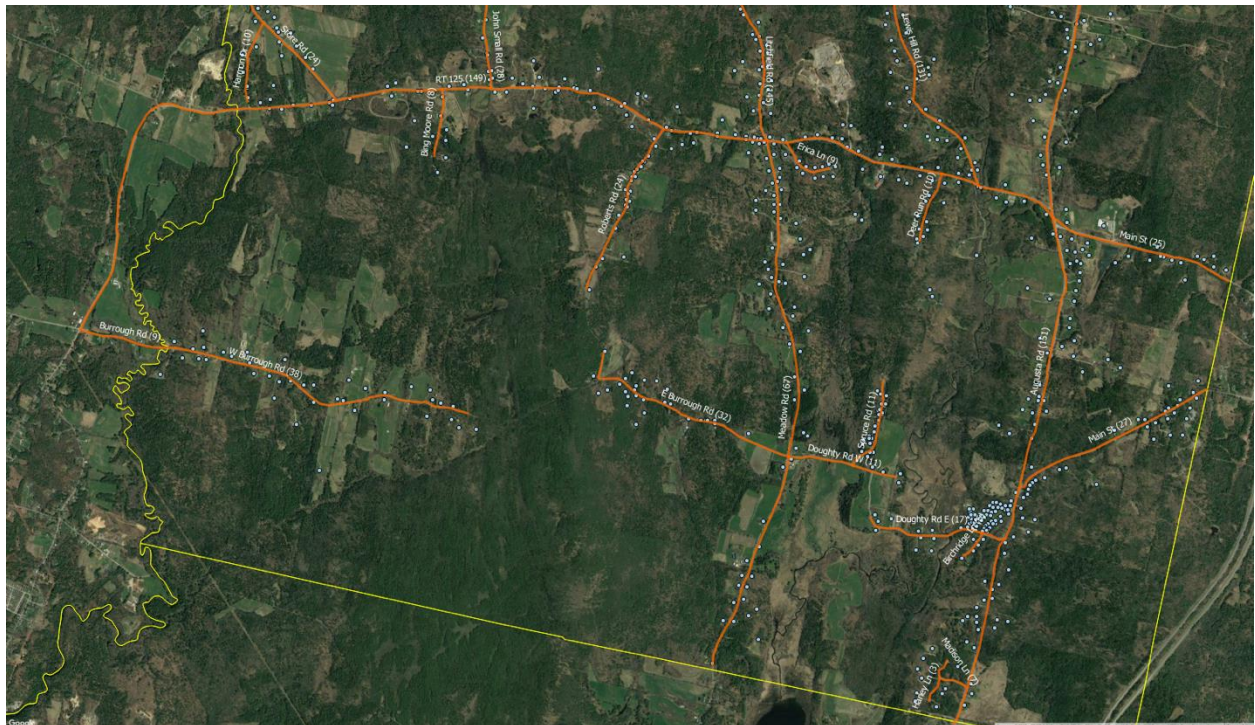
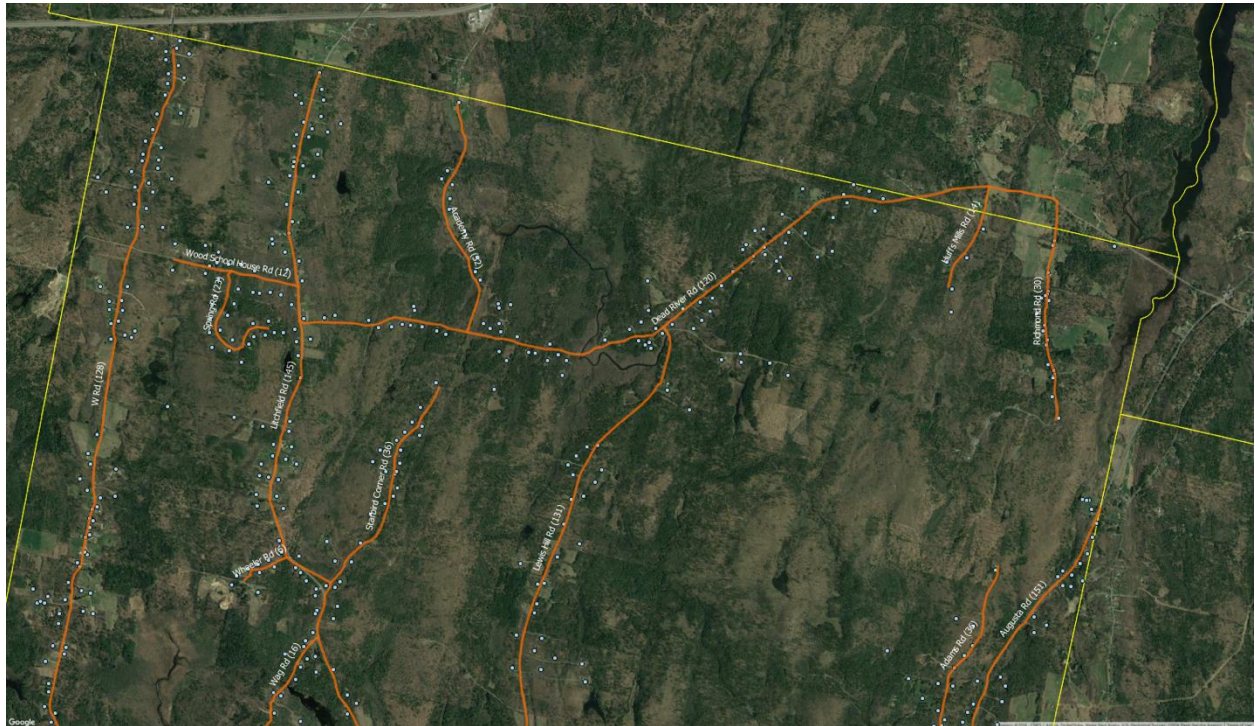
Increased Home Values- A Broadband Communities study indicated that FTTH networks increase the value of a \$300,000 home by an average of \$5,000-\$6,000. Another study by the FTTH Council in conjunction with the University of Colorado showed that homes with a FTTH connection are worth, on average, 3.1% more than homes that do not have a fiber connection

A fiber network can be leveraged to help communities differentiate themselves in positive ways. Letting the world know that you are on the cutting edge of realizing what homeowners and businesses are demanding to help them work or play online more efficiently, drives prominence for your town and encourages both in-migration and business growth.

In short,

- Fiber is a long-term investment in a community's future
- Fiber supports 21st century economic opportunities
- Fiber leapfrogs communities that are left behind to the front of the pack
- Fiber, over the long run, is a less expensive technology

Fiber Plan



The fiber plan proposed is based on three criteria:

- Equal Access to All- no matter where you live in Bowdoin, your home would have access to the same speeds and reliability as any other resident
- The provider, on behalf of the town, would undertake a pole licensing and make ready process that would allow for the fiber to be strung on the utility poles
- Our recommendation for fiber optic equipment is “active ethernet”, often called CWDM... more on the technology recommendation as you read on

Cost

| Bowdoin w/Licensing and Make Ready | |
|--|--------------------|
| Fiber Materials | \$899,365 |
| Fiber Labor | \$964,026 |
| Licensing and Make Ready | \$371,080 |
| Replacement Poles (10%) | \$441,000 |
| Regen Hardware | \$271,055 |
| Customer Premise Hardware & Installation | \$701,000 |
| Total | \$3,647,527 |

Components of Cost of Project

Fiber Materials

Fiber Materials refers to the cost of the trunk cable and associated equipment to hang the cable and the equipment needed to power the internet system.

Fiber Labor

Fiber Labor refers to the cost of manpower needed to string the fiber along the utility poles.

Licensing and Make Ready

Licensing and Make Ready refers to the cost of applying for utility pole rights and the associated cost of making the poles ready to accept a new fiber cable. In order to install new fiber optics cable on utility poles, a licensing process is in place that evaluates each pole for readiness to accept a new cable. Each provider (other than the electrical) would move the current lines to accommodate a space for a new cable. The cost of this process is estimated in our calculations and can change depending on the application process costs associated with each pole.

Replacement Poles (10%)

We estimate that 10% of the poles, through the licensing process might need replacement. There are two major reasons for pole replacements. First, the amount of equipment or utility lines on a pole deem it necessary to increase the height of the current pole to allow for an additional line to be placed on it (pole too short). Or the current pole is aged to the point where it would be unsafe to place the additional line strain on the pole without a replacement pole. (Aged poles). We make an estimate, but these issues get addressed through the application and Make Ready process.

Regen Hardware

Regen hardware is the equipment that would be used to power the internet system and control each individual connection through this central system. These costs also include a heated and cooled utility shack that would house the equipment.

Customer Premise Hardware and Installation

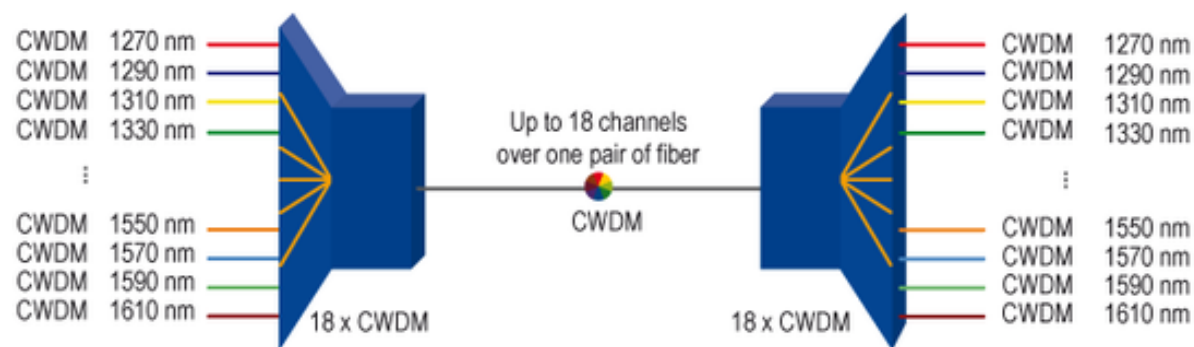
These costs are associated with the equipment needed at each home, the drop cable and the labor cost associated with each customer installation.

Cost Breakdown by Street or Road segment

Because of the large number of street/road segments, we have not included as part of this report but are available upon request.

Proposed Fiber Equipment

CWDM (Coarse Wavelength Division Multiplexing)



Our cost estimates use a fiber technology hardware called Coarse Wavelength Division Multiplexing (CWDM). This system allows up to 18 connections over a single fiber pair by having each connection operate on a separate light wave.

This allows multiple premise connections operating over a single fiber pair that can each carry up to 10Gbps (10,000Mbps), depending on the hardware used. This allows up to 180Gbps (180,000mbps) of data to be transmitted on a single fiber pair. 40G and 100G CWDM transponders are in the development pipeline.

What does this mean for communities deploying this technology?

- Saves cost, because size of trunk cable has potential to be sized differently (smaller)
- Allows for inexpensive connections up to a Gigabit to each business or home and can increase to 10Gigs (10,000Mbps) with off-the-shelf hardware upgrades. Even 10G CWDM transceivers are relatively inexpensive today at about \$100/each
- Scalable, allows for a single fiber to serve up to 18 businesses or homes, can easily accommodate years of new growth with just a few additional strands of fiber

The CDWM solution saves cost, but not at the sacrifice of performance. First, the trunk line that will serve as the main line of fiber that is used to create “drops” (fiber connections) to each premise does not need to be as large, saving space, reducing tension and weight on the existing utility pole infrastructure that the truck line would be hung. Using CDWM allows the trunk line size and weight and cost to be reduced, while still offering excellent scalability.

Weight and tension matter when you consider poles can cost up to \$3,000 a piece to replace. Every 10 poles of replacement cost you can avoid saves \$30,000. The size and weight of the fiber cable can have a direct relationship to potential pole replacements.

With inexpensive optics, up to 1Gbps (1000Mbps) could be offered to each home today. Unlike with cable, or even other fiber technologies (xPON), this is not a shared connection – the network truly supports a full Gig to each home. As time passes, we imagine a day when more than a Gig of service would be needed at each premise. At that time, optical equipment can easily be switched out to offer up to 10Gbps (10,000Mbps) of service for a robust upgrade that is both easy and inexpensive.

When looking at future proofing a network, this design allows for almost unlimited speed and capacity increases without changing the actual fiber deployment on the street. As fiber has become the chosen technology for connectivity, equipment providers continue to innovate by changing the hardware on each end of the fiber to increase capability, without having to reinvest in a whole new system. We are comfortable recommending a system that will easily last 20 years or more with relatively small, if any, equipment upgrades over the life of the fiber.

Final Thoughts

Bowdoin's focus on cultivating a relationship with its current cable provider has produced mixed results. It cannot be overlooked that Comcast is making a significant investment in its current infrastructure and equipment in Bowdoin that will bring a much better customer experience and potentially include better internet choices for those who can receive a connection. This is very good news for those that currently have Comcast as their provider. On the other hand, it has been a very long process to get to this point, with months of frustration and concerns about Comcast's willingness to move forward with upgrades.

Earlier this year, Comcast confirmed that it was moving forward with the upgrade to current customers and that the engineering work "looked good" to expand service to every home in Bowdoin. Subsequent to that, there was discussion about potentially applying for a ConnectME infrastructure grant to expand to those areas that were unserved. After these positive announcements, additional conversations seemed to push the expansion off, with Comcast indicating that while the upgrade to current network would proceed in the first or early second quarter of this year, expanded service was not going to be "looked at" till late April or May 2018.

In addition, a conversation with Consolidated Communications did not indicate any plan for expansion to the unserved areas.

It is in this context that we make our recommendations.

- Continue to work with Comcast to expand serve
 - It is the least risky option
 - It is the no-cost, or least expensive option

Given the cost-conscious nature of town government and Bowdoin citizens, the fiber solution is likely only attainable with substantial public subsidy coming from a federal grant. Only the areas unserved are eligible for a state grant and the cost of the fiber makes an application that will only serve unserved areas of the community uncompetitive unless the community is willing to make a substantial contribution of several 100s of thousands of dollars to the project. Through our years of grant writing success and failure, we do not see Bowdoin being an area that will be seen as urgently needing a federal grant for connectivity, especially given that a good portion of the community will have upgraded Comcast service.

On the other hand, new federal money for broadband is slated to be released this fall, FTTH projects are favorable to funders and the new rules for this money are being discussed and disseminated for public comment. It is likely that this money will attract a large number of competitive applications. We have also included other federal grant options for the community to consider, should you decide to pursue funding for an internet connectivity project.

Axiom stands ready to advise and consult on any information contained in this report or be considered a resource at no cost to the town in the future on anything related to Broadband.