Regional & Town Plans

Presented to:
Lincoln County Broadband Committee

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Axiom
every connection counts

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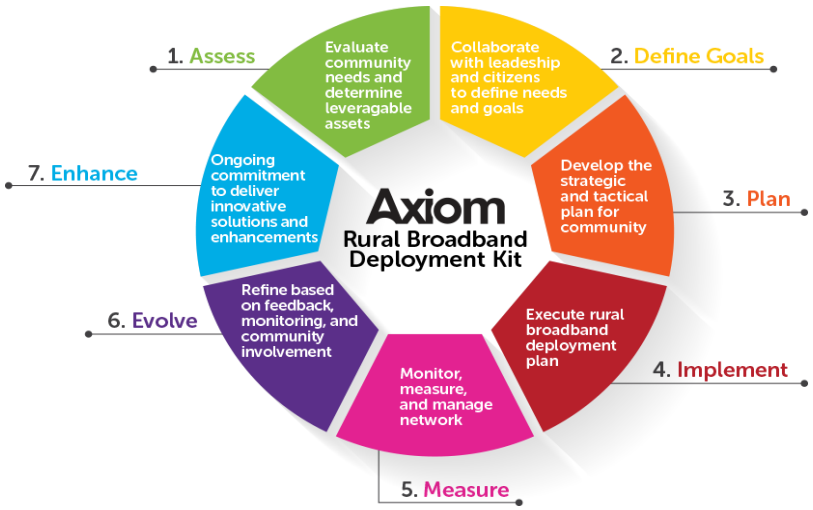
Executive Summary

Axiom was chosen as the planning partner by Lincoln County Regional Planning Commission (LCRPC) to assist a seven-community group of towns to determine their choices to increase internet connectivity. Over the past several months, the group of communities have convened regularly in shared learning sessions to begin or settle on a strategic direction for each of their towns. In addition, there emerged consensus that a regional approach or opportunities for like-minded communities to work together.

Axiom uses a planning and deployment process that helps move communities through the first three steps, with the goal of implementing in those communities or defining and implementing potential regional opportunities around Broadband.



Plans

- Customized recommendations for each community
- Mapping and coverage information from current providers
- Fiber plans for those communities that requested them
- A regional plan that is meant to begin a conversation about a locally owned shared system

Implementation

This planning document is meant to provide a springboard to implementing the recommendations contained in this report. We provide a menu of options, based on the goals of the community, to help identify actionable projects to help communities build their internet capacity. To this end, we have included a list of potential state and federal grant programs that towns or the region may consider to fund these projects.

Axiom stands ready, long after this planning phase is completed to answer questions, attend meetings and work with LCRPC or any community to implement these recommendations. This document should be considered a beginning to a process of bringing better internet connectivity to the region or individual communities.

Regional Approach

Lincoln County Regional Planning Commission (LCRPC), with its planning partner Axiom, was awarded a ConnectME grant to help seven communities plan and implement solutions to enhance internet connectivity. LCRPC and Axiom have been meeting with the seven towns that were part of the grant- Wiscasset, Edgecomb, Westport Island, Dresden, Whitefield, Jefferson and Somerville- and the general feeling is that a combined approach- a regional approach- might make sense to explore. This part of the overall report will begin to frame the strategic pathway to better explore this option.

For many small rural communities, the thought of improving internet connectivity on their own is a daunting task. With little municipal infrastructure or professional staff, these communities are hard pressed to assemble the right community leaders together to evaluate what needs to be done and agree on how to fix the problem.

One option facing the towns in Lincoln County is to consider banding together and forming a Regional Broadband Utility. This type of structure would create a legal entity that would manage and operate a fiber optic broadband system that would connect to communities in Lincoln County (or potentially beyond) under one unified set of rules and that would ensure representation to participating communities. This approach would create a system whereby a community would not be forced to act on their own nor be left behind. Collectively they would share resources, learning and a common broadband infrastructure, as well as some percentage of revenues.

Typically, a Regional Broadband Utility is organized by creating an independent board of community members from each of the participating communities that would have oversight over the new fiber optic infrastructure. In this arrangement, the Utility can take several forms, but would most likely partner or contract with a Broadband provider to run the day to day operations and all of the different aspects of a fiber network.

Collaboration

One important element to successfully implement a regional approach is to have strong regional institutions that can help pull towns and resources together to develop the plan to form a utility.

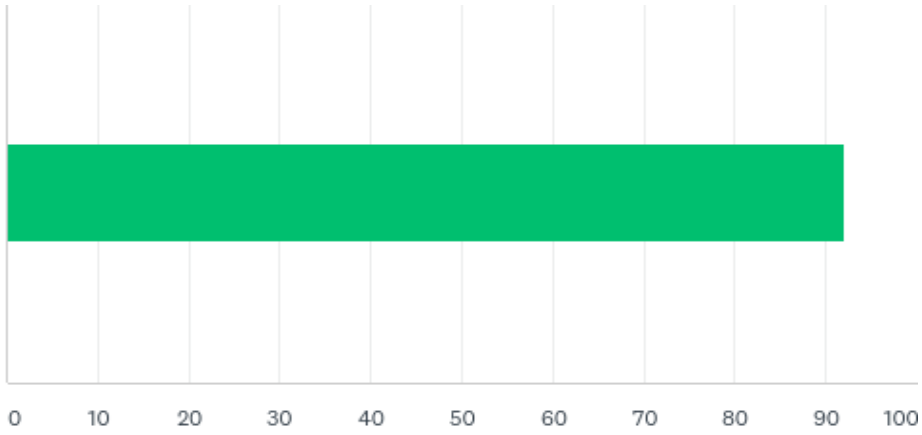
LCRPC is a respected partner in the region and works closely with communities across Lincoln County. LCRPC's mission is to create sustainable economic growth with various tools including land use and transportation planning, business assistance, and housing development. Broadband internet, and the lack of connectivity is suppressing economic growth and affecting other areas of focus for LCRPC.

Because a portion of funding for the organization comes from County Government, LCRPC and the County Commissions work hand in glove on a number of important initiatives. The County government has unique functions in this County, as compared to others in Maine (county-funded planning and economic development staff, for example). All three County Commissioners represent communities that are planning to build better broadband. The County and LCRPC should be natural partners to help the region think about its internet future, the structure of a regional entity and the ability of County and LCRPC officials to bring experts to the table to work on best practices.

Lincoln County Regional Planning Commission

LPRPC has been working with the seven communities for over a year on assessing internet connectivity and is beginning to work with other interested communities in Lincoln County that would like to explore options for better connectivity. Through our surveys, survey responders indicated that they were strongly supportive of LCRPC's involvement to help communities with this important issue.

Q20: On a scale of 1 to 100, with one being the least support and 100 being the most support, do you support Lincoln County's and your town's planning efforts to assist with internet improvements?



ANSWER CHOICES	AVERAGE NUMBER	TOTAL NUMBER	RESPONSES
	92	32,654	355
Total Respondents: 355			

Take Away of the Survey:

- People recognize how important internet connectivity is to their communities, even from those that have reasonably good service
- Residential service is as important as business service because of the large numbers of citizens that work from home
- Spectrum service generally is considered too expensive; Consolidated service is reported as not reliable
- Other local providers also are frustrating people, except for LCI fiber which was well regarded in survey responses
- Strong support for Lincoln County to help- much stronger than expected across all communities- 355 individual responses with an average score of over 90 out of 100 in importance

Forming a Municipal Broadband District

The Maine legislature has expanded the uses for forming a utility district beyond the familiar water, sewer and electricity to also include broadband. Municipal Broadband Districts can be modeled like other Municipal Utility Districts (MUDs) and would be formed to give communities maximum flexibility and control over public assets, while using revenues from new internet subscribers to help partially defray the capital cost of building and upkeeping the network.

A Municipal Broadband District would form a Board of Directors elected or appointed by the participating communities. The Board would oversee all aspects of construction and operations.

Broadly speaking, a Municipal Broadband District would have authority to:

- Form a Board of Directors, based on a set of criteria developed by participating communities
- Issue Bonds or other municipal finance instruments
- Develop and approve RFP(s) to manage or support various aspects of the fiber assets
- Accept payments to support debt payments or ongoing maintenance of the system
- Negotiate contracts with Internet Service Providers or other experts to operate the network on behalf of the Municipal Broadband District
- Set rates and oversee all or some of the utility district operations

Where do you start?

There are a series of questions that come with forming these types of districts and participating communities often can be hung up on representation issues, smaller communities feel they would want equal representation, and larger communities typically prefer proportional representation. As the communities explore working together, they might want to access resources available to them from other communities that have done this before. In Maine, there is one current Municipal Broadband Utility- Downeast Broadband Utility. It was formed for Calais and Baileyville. Contacting them would help you understand the details of how they came together. Their email is downeastbroadband@gmail.com.

The Institute for Local Self-Reliance (ILSR) is a strong proponent of communities advancing their own future by investing and owning their own internet infrastructure. They have developed a Community Connectivity Toolkit and have highlighted a series of example communities around the United States that can help communities considering this approach learn what other communities around the United States are doing. Go to muninetworks.org to gather a host of information, click on the Initiatives tab/Broadband for a list of example towns and their experience.

The ConnectME Authority also has a myriad of support and resources that may help guide thinking at maine.gov/ConnectME/home.

Utility Formation Steps

A Municipal Broadband Utility District is a special-purpose district that provides internet service to residents of the defined district. Forming a new district takes time and money and requires the commitment of the involved communities and its elected officials.

- Start with champions- a group that will spearhead the effort
- Feasibility Study to determine if a Broadband Utility is feasible and has community support
- Evaluate financing alternatives and feasibility- bonds or borrow
- Legal Analysis- Investigate the do's and don'ts of current statute
- Individual Community education and vote to support effort
    - Should the town by authorized to join the Broadband Utility?
    - Should the Broadband Utility be governed by an independent board?
- Negotiations with Internet Service Providers

Benefits of regional approach

Own your own

Creating publicly owned broadband infrastructure is typically a response to market failure, where the incumbent providers believe that they will not make a return on any new investments. Currently, the companies that serve the region do so based on market forces and their ability to maximize a profit. These leaves the region with uneven coverage, with the coverage area, price and amount of speed and reliability all dictated by current providers. Owning your own creates a new reality where the communities, speaking through the Utility, now can negotiate better terms, create more competition and be better positioned to provide access to the network on their terms.

Equal Access to All

Current internet connectivity is dictated by the provider of service, leading to inequitable service based on where a subscriber might live. In some areas, there is no service at all. In others, a home can receive 100Mbps of service. When you publicly own the service, you can dictate that all homes are able to receive the same type of service and pricing, no matter where you live.

Cost Savings

Banding together can save cost as economies of scale are achieved. Larger projects can be less expensive when materials are bought in bulk or construction labor can do the full job all at once and not have to come back. It is hard to say how much savings, as so much is determined by market forces at the time of the construction project, but generally we would think that a 10% savings is achievable.

Open Access

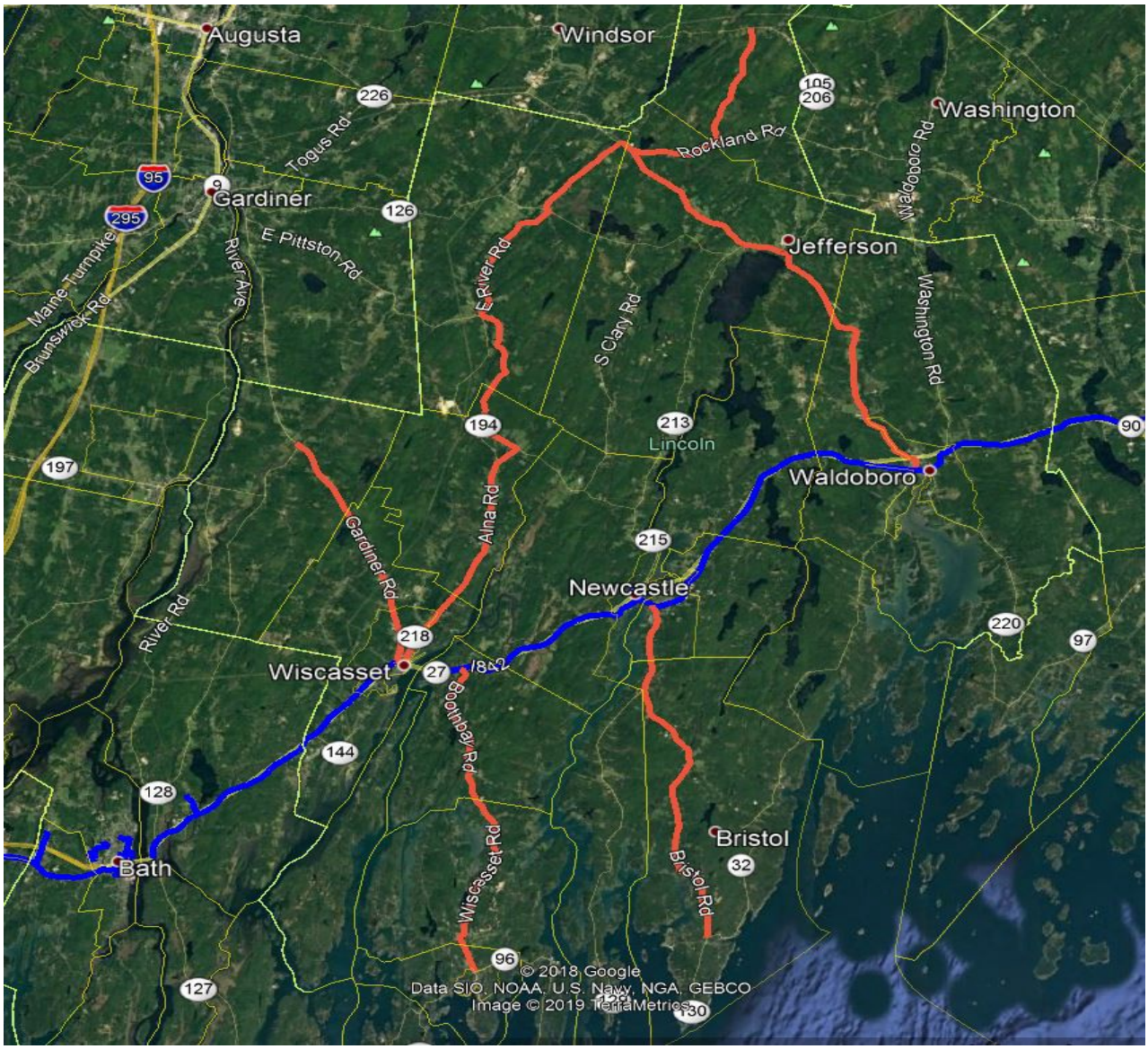
Owning your own infrastructure allows you to offer access to multiple ISPs that can compete for subscribers and drive costs down. By banding together multiple towns, it creates enough scale to likely attract multiple providers to the network.

This fact sheet from the Institute for Local Reliance describes the ways in which communities are thinking about and implementing publicly owned networks.

https://muninetworks.org/sites/www.muninetworks.org/files/2017-07-Muni-Fiber-Models-Fact-Sheet-FINAL.pdf

The Plan

Axiom has created an approach to costing out a fiber optic network that would penetrate communities. Each piece is priced out separately, so that they can be mixed and matched as necessary. We did not consider the whole county, as that is beyond the scope of our planning work here, but we did include some communities that are in general area of our planning communities because it made sense to do so.

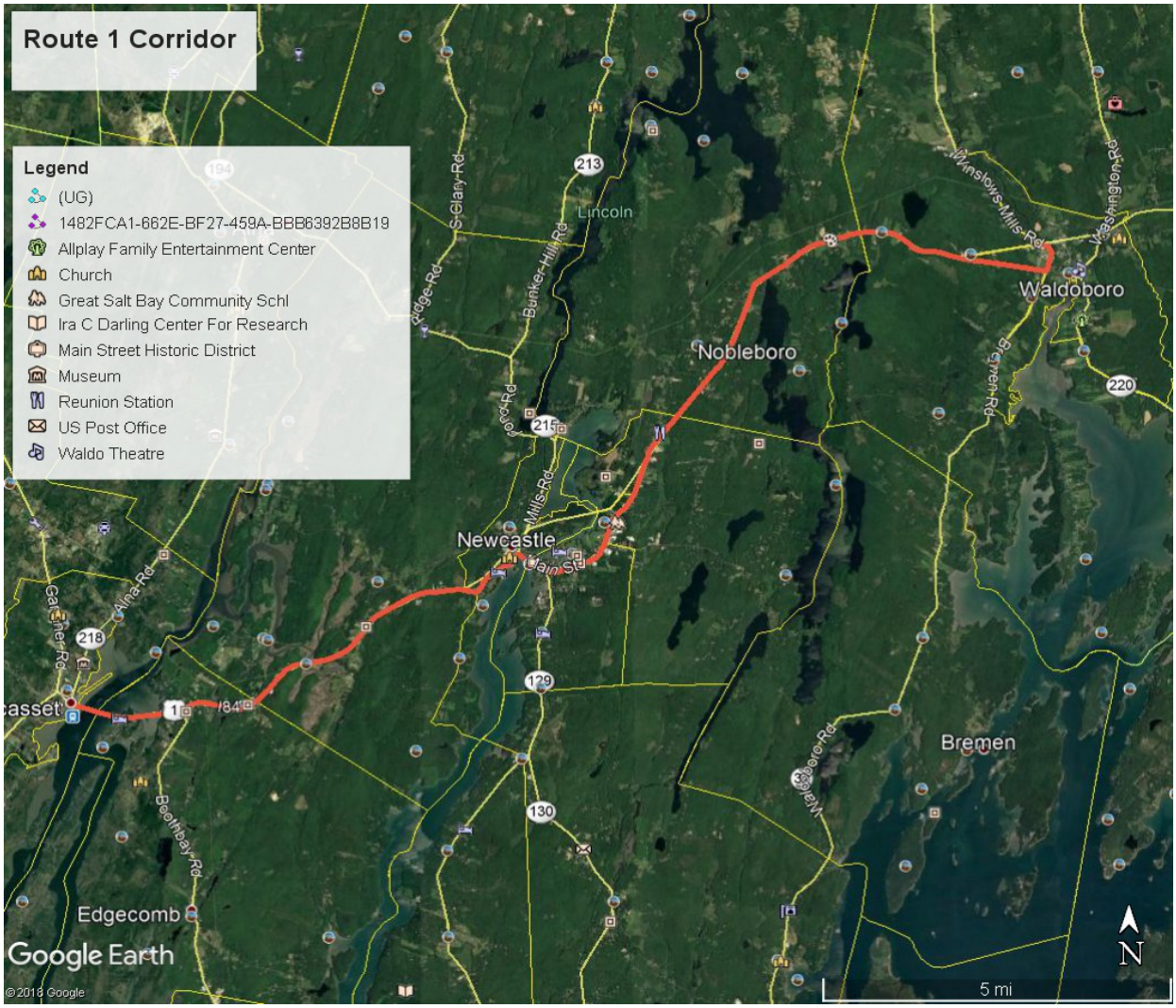


Blue Line= 3 RING BINDER
Orange Lines= New High Capacity Fiber

The 3 Ring Binder (3RB) is indicated by the blue line, however, we have priced the new service to include additional fiber along Route 1 in order to serve customers. The 3RB is intended to operate like a highway, to quickly move data to areas that then have to create off ramps for that data that then can be distributed to whatever area you intend to serve. The 3RB is not intended to serve individual customers. However, because of the number of providers that can serve Route 1, it may not be necessary to include this segment in the overall price.

While any resident or business can be served along the proposed fiber routes, these routes are how a publicly owned utility might approach bringing capacity to each community. From these trunk lines, community projects that would bring fiber to each home would be built. Those plans for each community are in another section of this report. The following pages are the pricing for each section of this trunk fiber.

Route 1 Corridor - Runs along Route 1 from Wiscasset to Waldoboro



Route 1 Corridor		
Materials and Labor		$904,310
Pole Licensing application		$11,942
Make Ready	(estimate)	$105,525
Pole Replacement	(estimate)	$140,700
Total Cost		$1,162,477

Jefferson Ring

The Jefferson ring connects on Route 1 in Waldoboro and runs up through Jefferson into Whitefield and down through Alna, and into Wiscasset.

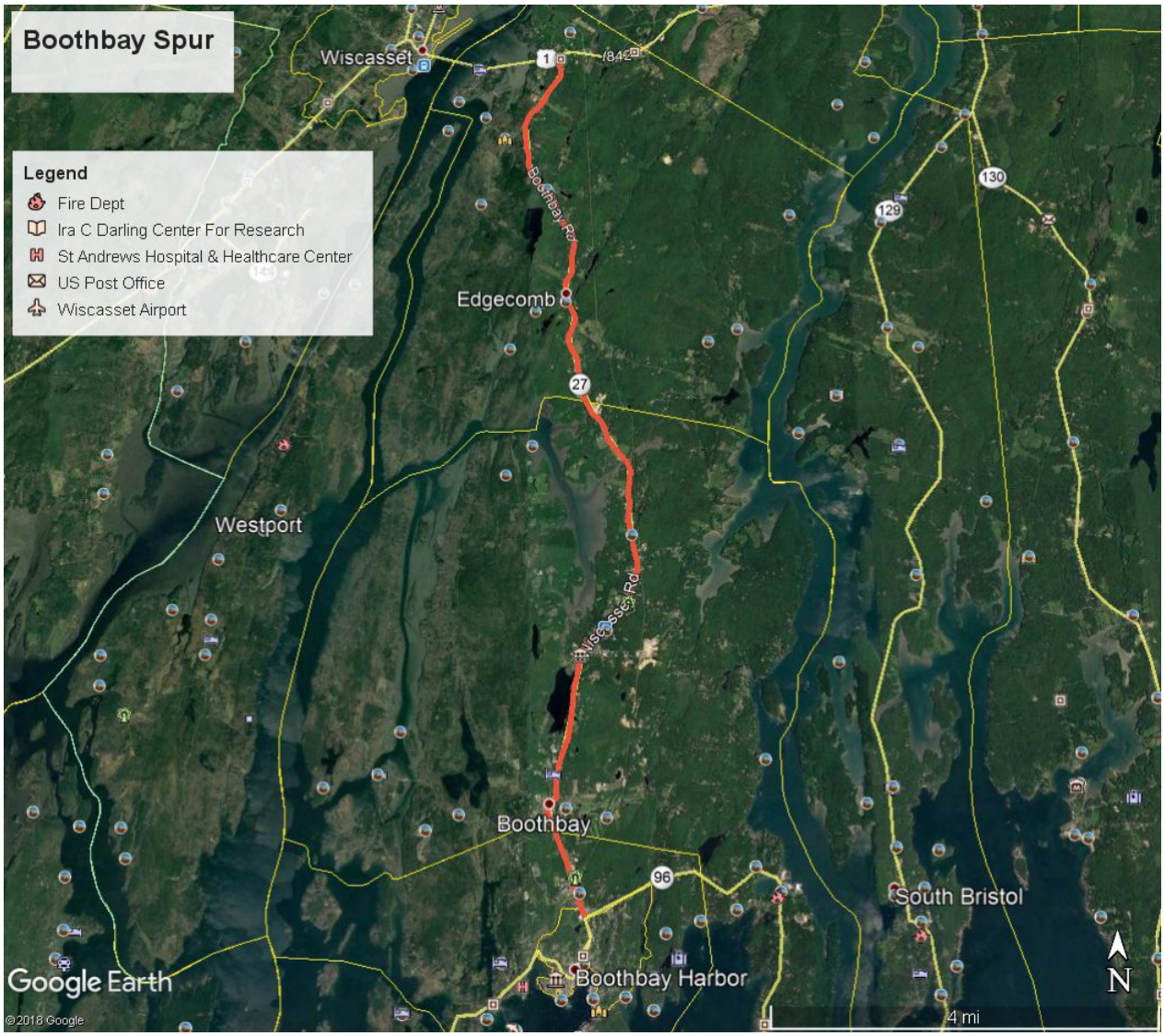
Jefferson Ring Cost		
Materials and Labor		$2,287,093
Pole Licensing application		$24,154
Make Ready	(estimate)	$206,775
Pole Replacement	(estimate)	$275,700
Total Cost		$2,793,722

Dresden Spur

The spur serving Dresden starts in Wiscasset and runs just past Dresden Town Office to the corner of Route 27/127.

Dresden Spur Cost		
Materials and Labor		$438,406
Pole Licensing application		$5,978
Make Ready	(estimate)	$48,600
Pole Replacement	(estimate)	$64,800
Total Cost		$557,785

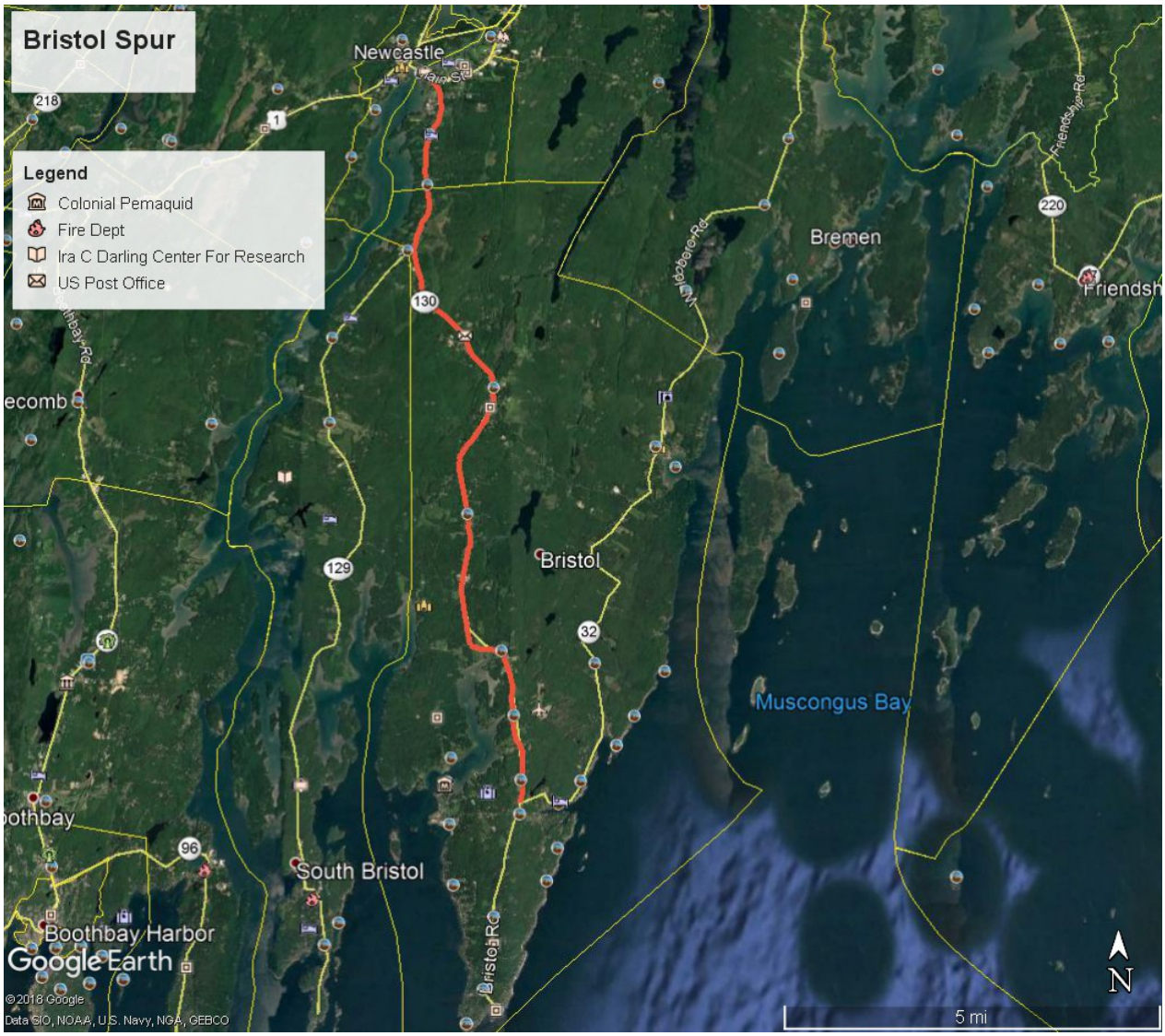
Boothbay Spur



The spur is intended to serve Edgecomb and extends to the corner of Routes 27 and 96 just over the town line in Boothbay Harbor.

Boothbay Spur Cost		
Materials and Labor		$660,292
Pole Licensing application		$8,022
Make Ready	(estimate)	$69,525
Pole Replacement	(estimate)	$92,700
Total Cost		$830,539

Bristol Spur



The Bristol spur comes from Route 1 in Damariscotta and runs down Route 130 to New Harbor.

Bristol Spur Cost		
Materials and Labor		$622,758
Pole Licensing application		$9,649
Make Ready	(estimate)	$81,225
Pole Replacement	(estimate)	$108,300
Total Cost		$821,932

Somerville Spur

The Somerville Spur runs up from Jefferson ring from the corner of Routes 32 and 17 ending on Route 105.

Somerville Spur Cost		
Materials and Labor		$283,493
Pole Licensing application		$3,963
Make Ready	(estimate)	$31,950
Pole Replacement	(estimate)	$42,600
Total Cost		$362,007

Total Cost

Total Cost of Regional trunk		
Route 1 Corridor	(Optional)	$1,162,477
Jefferson Ring		$2,793,722
Dresden Spur		$557,785
Boothbay Spur		$830,539
Bristol Spur		$821,932
Somerville Spur		$362,007
Total Cost		$6,528,462

PLEASE NOTE:

Make-ready and pole replacement costs are estimates and will not be known until a Pole Licensing Application is submitted and the process is initiated. During the make-ready process, each pole is evaluated to determine the physical capability of accepting a new fiber line and the cost of moving existing cable lines on the pole to accommodate the new system. This could change the estimated cost of make ready and pole replacement.

Town Plans

Some communities may work together, others may decide to move forward on their own. The next section is designed to give each community individualized plans and recommendations.

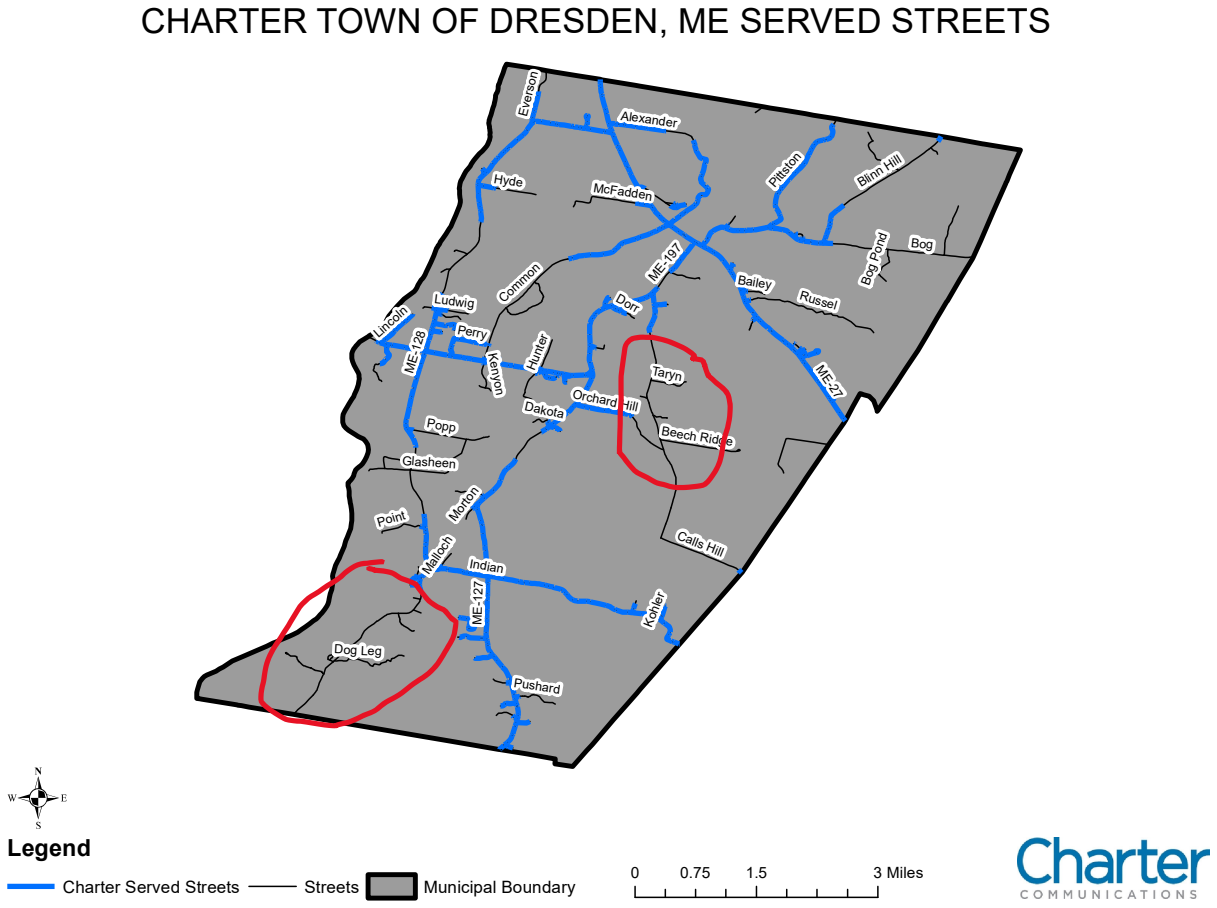
Each of the town plans have been engineered and designed to stand on their own.

Dresden

Dresden has several options to enhance their service, but those options depend on the appetite of the select board's goals and their willingness to participate in any solution. It's clear that those who are on the committee and don't have Spectrum (Charter Communications) want something to be done to fill in those areas that have no service or very poor service from Consolidated Communications.

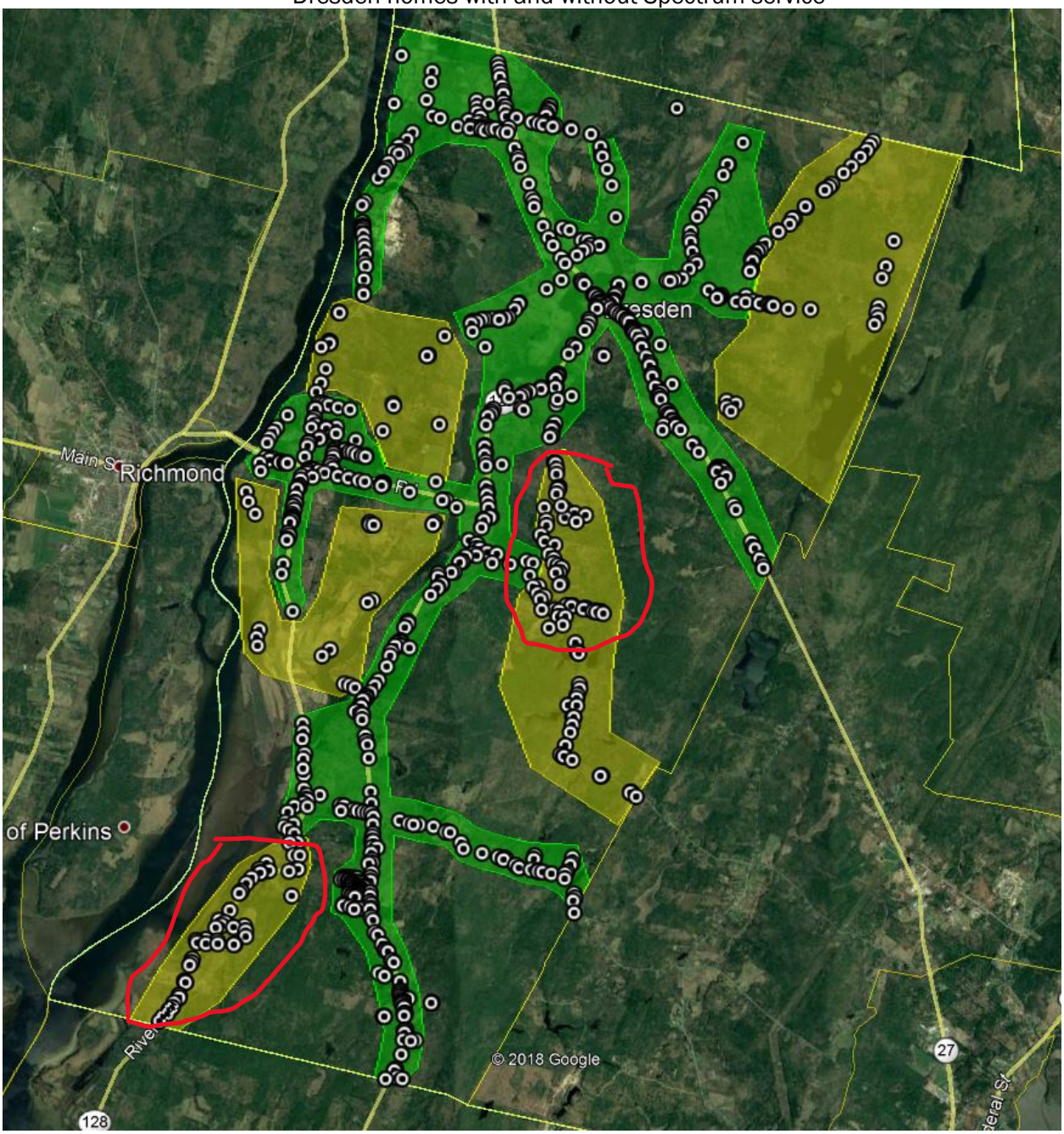
Option #1- Work with Spectrum

Spectrum serves the areas with the densest number of homes, leaving the more rural parts for other providers, mainly Consolidated Communications to serve. However, there are at least two areas where it appears that the density required (20-25 homes per mile) that Spectrum requires for buildout could be met. Pointing out these areas to Spectrum would be a positive step forward to see if the areas do indeed meet their requirements and if an opportunity to build out, at least to those areas makes sense.



The two areas circled in red seem to meet the number of homes required to have Spectrum consider building out. It's important to remember, they still may need some support from the town or a grant to help make the economics work. You can see the density of homes in the next map that provides a visual representation of E911 addresses in the community.

Dresden homes with and without Spectrum service



Green= areas of Spectrum service
Yellow= Areas not served by Spectrum

Option #2- Consolidated Communications enhancements

We do not typically recommend Consolidated enhancements to their DSL service as it is unreliable and limited in upgrade possibilities. However, its likely, given the current levels of service offered by Consolidated that they did not use federal money to increase speeds and reliability. Over the past few

years, many communities have benefited from a Connect America grant that Consolidated was awarded to enhance and expand service to dozens of communities across the state. That does not appear to be the case here. If no investment by Consolidated has been made, they potentially could be interested in working with the community.

Consolidated Current service levels

Speed/Bandwidth [Max Available]	# Locations	% available
768K/3M	93	9.4
7M	123	12.5
10M	145	14.7
20M	59	6.0
25/2M	198	20.1
40M	-	-
60M	-	-
80M	-	-
NS	368	37.3
TOTALS	986	100.0

37% of homes (368) are not served by Consolidated. All homes that are served do not meet the federal standard of 25/3Mbps. Perhaps upgrading their equipment might expand and enhance current service. Depending on Consolidated's current equipment locations, upgrades might be possible, and relatively inexpensive (less the $75,000 per Remote Terminal upgrades where enhanced equipment would be placed).

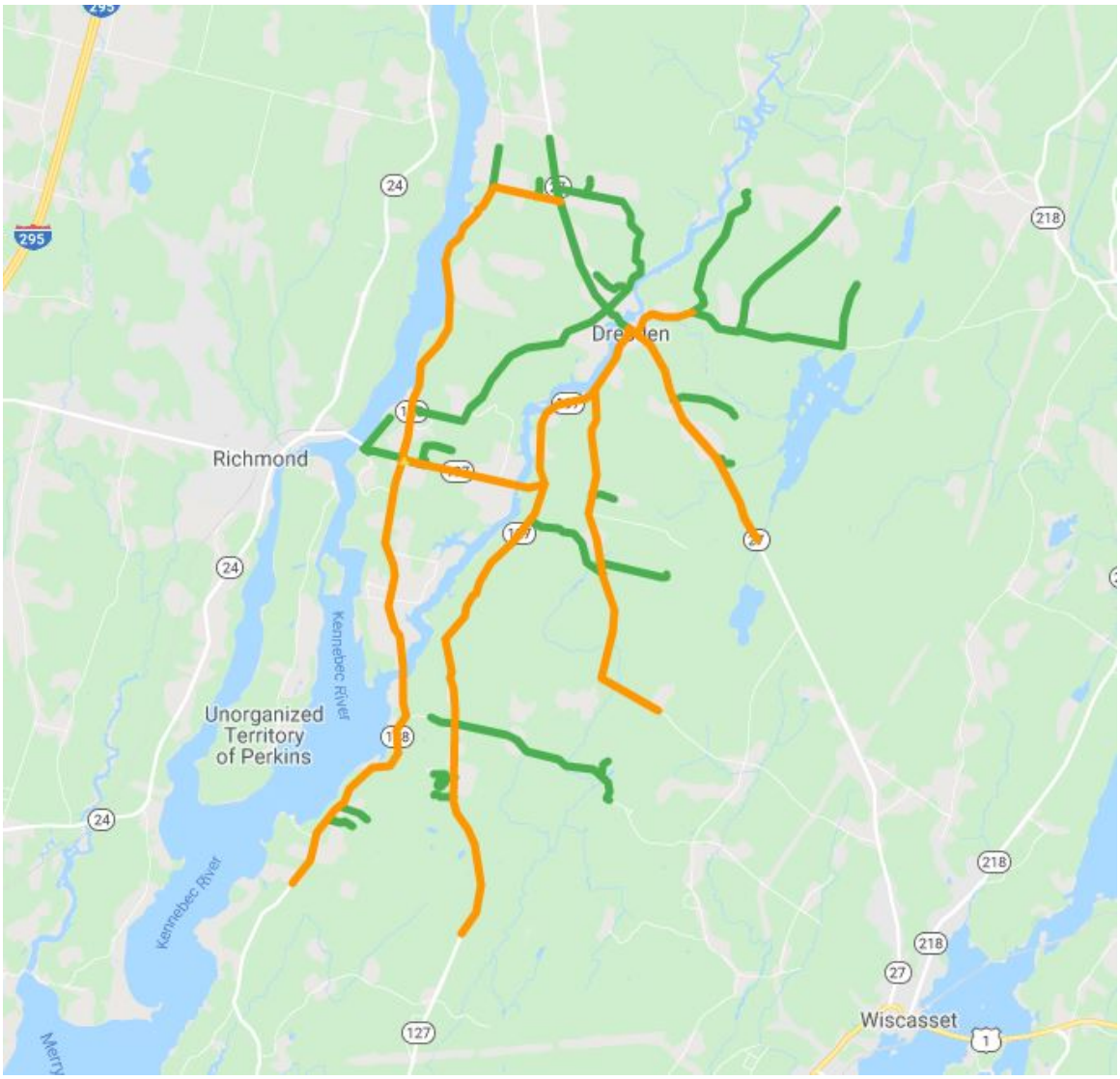
Option #3- Full fiber build out

Given the number of homes that are underserved or not served at all, Dresden is a viable community to attract another provider to build out service to serve the whole community that would greatly increase reliability and speeds across all of Dresden. However, the cost to build such a system would need to combine public subsidy at the local, state and federal levels, along with some participation by the new provider of service.

Fiber systems meet three goals:

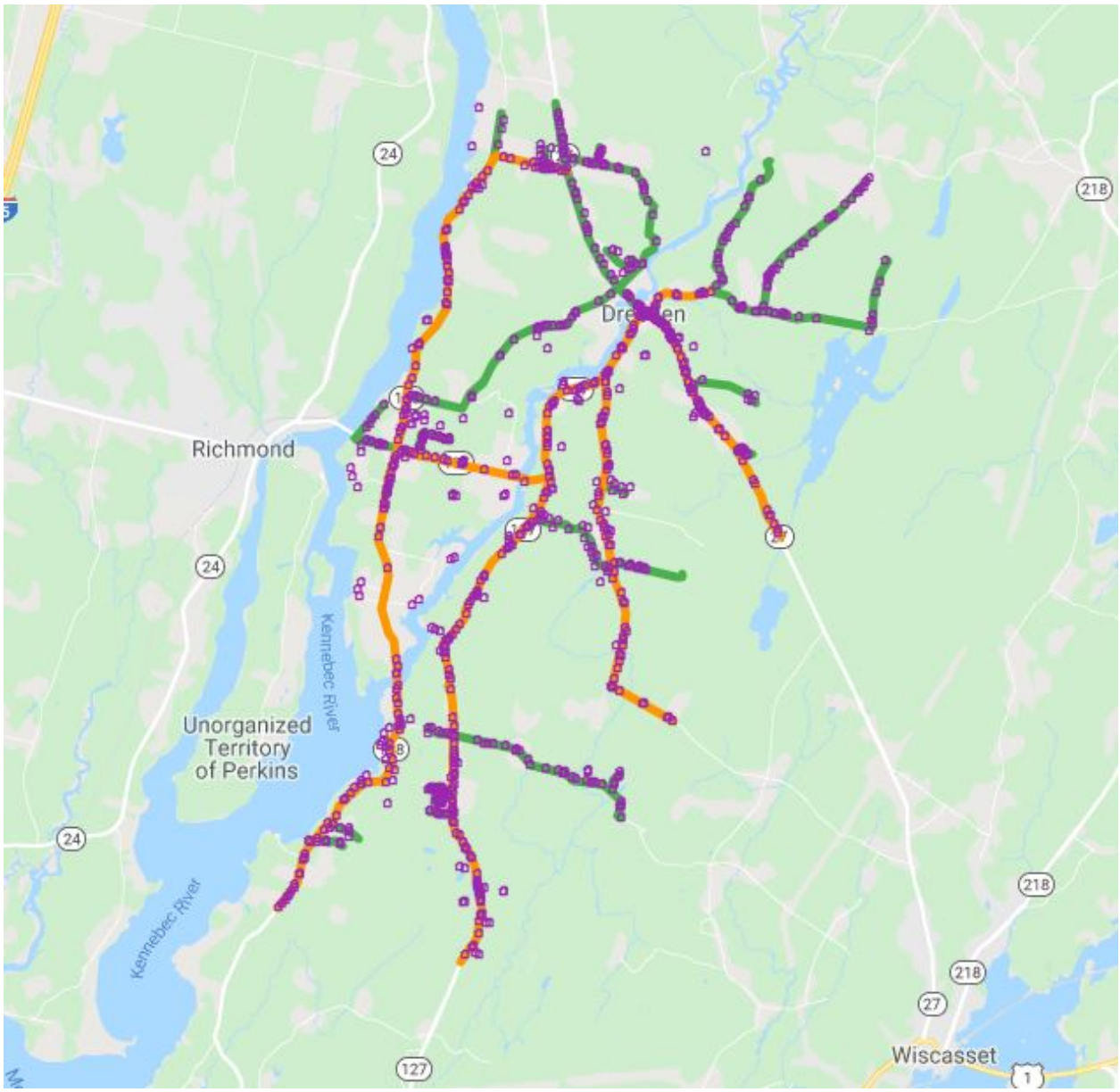
- Equal Access to All- no matter where you live in Dresden, you are able to receive the same level of service as anyone else in the community, regardless of your address.
- Fast and Reliable- Fiber offers the fastest speeds- by far. While at the same time giving subscribers unrivaled reliability.
- Futureproof- the system's capability can be upgraded easily without any changes or cost to the system architecture. As demand increases, the system can handle up to 1 Gig of service (1000Mbps) to each home, making the system futureproof for 20 years or more.

Fiber Routes



Orange lines= Trunk- High Count fiber lines
Green lines= Drop- Lower Count fiber lines

Fiber Map with E-911 addresses



Orange lines= Trunk- High Count fiber lines
Green lines= Drop- Lower Count fiber lines

This is the same fiber map with E911 addresses added to give you a good visual of the density of homes across the community. The map does not depict each connection from the fiber to the individual homes. However, we have built into our pricing model connections to every home that wants service. All homes would be capable of receiving a connection from this construction design.

Cost

Category Description		Cost
Materials		$2,087,910
Pole Licensing Application		$70,842
Utility Pole Make Ready	**Estimate**	$353,475
Utility Pole Replacement	**Estimate**	$471,300
Regen Hardware		$291,535
Customer Premise Drop Cable	**Estimate**	$96,360
Customer Premise Installations		$657,000
Total		**$4,028,421**

The total cost of the budget contains several line items that may change and lower the cost of the project overall. A lot of additional costing information will be learned by proceeding with the pole licensing process. For example, we have made some assumptions based on past experience, but the true understanding of the costs associated with pole attachments and make-ready - the cost of other users of the poles moving their lines to "make-ready" a space for a new cable - only will come through the licensing process. In addition, pole replacement costs are estimated and will not be known till the pole make ready work is completed.

This budget contains the hardware for 100% of homes to be connected, however, we calculate a take rate of 40% in year one, which would reduce the up-front cost of customer premise installations by approximately $400,000. Along with other potential reductions, we would expect the cost of construction to be $4M or less.

Breakdown of Cost Components

Materials
The materials line item is the total cost of all the materials and equipment needed to install the system minus the CO/Regen equipment and the Customer Drop Cable, which are located on separate line items.

Pole Licensing Application
This plan requires the placement of fiber optic cabling to be placed on existing utility poles across the community. In order to receive approval, a several step process of several months is required, but begins with the application. The cost of the application is based on the number of utility poles you would like to attach to.

Utility Pole Make-Ready
Make-Ready is the cost of making the poles ready (make 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 the evaluation of each pole will take place during the pole licensing process.

CO/Regen Hardware & Installation

CO refers to Central Office, which is a term of art that Internet Service Providers use to describe where the equipment that would be needed to power the system and where the internet would be distributed from to each home. 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 Cable

This is an estimated cost of the fiber to connect each home from the street to the home.

Customer Premise Installations

These costs are associated with the equipment needed at each home. This is the cost of connection 100% of the homes.

Revenue and Expense Model

As part of Axiom's commitment to our mission to help rural communities more fully understand what ISPs are facing serving a small community, we have created a revenue and operational expense budget that helps the community and the ISP better negotiate an operating agreement through a Public-Private Partnership, should the community choose to own the fiber network.

It's important to understand that these are just an illustration of how Axiom would envision the feasibility of operating a system and what potential customer rates could look like. The potential revenue is based on service levels and take rates that are solely Axiom projections and are intended for illustration only, each provider would have their own revenue and cost models. However, these numbers can show you generally what a provider might expect if the town were to build a new fiber system and importantly, how much capital participation, if any, might be expected from the provider.

Revenue

Rate Group	# of Subscribers	Monthly Rate	Annual Revenue
25/5Mbps	245	$69.99	$205,771
50/10Mbps	70	$79.99	$67,192
100/20Mbps	35	$109.99	$46,196
Business Class-50/50M	5	$109.99	$6,599
TOTALS	350 (40%)		$319,158

- The Rate Groups and monthly cost are entirely Axiom's and may differ depending on provider
- Take-rate is the estimated number of homes we believe would take service. In Dresden's case we believe a 40% take-rate is achievable- in year one, with a steady rise as people in town convert slowly from Spectrum and Consolidated

Expenses

Yearly Operating Expenses			Yearly Cost
Bandwidth			$55,728
Phone Technical support			$4,569
Administrative support			$2,408
FC support (local)			$16,262
FC support (Remote)			$101,037
5% Gross Revenue returned to Community	(negotiated amount)		$15,958
	TOTAL		**$156,857**

Bandwidth is the cost of bulk wholesale internet.
Phone tech support is the estimated cost to maintain phone support for customers for the year.
Administrative Support is the cost of billing/collections and support for billing questions.
Local Field Crew is the cost of Axiom hiring a local person to conduct simple trouble shooting at the home. Field Crew (Remote) is the cost of dispatching FC from Machias to deal with more serious issues- breakage, splicing, etc.
Revenue return of 5% is Axiom's commitment to give 5% of Gross revenue- $15,958/year- back to the community for the life of any contract.

Three important takeaways of this section:

- ◊ How critical take-rate is to the overall viability of the project (less subscribers, less opportunity for profits)- In the case of Dresden, the number of homes would be attractive to a provider
- ◊ The monthly operating expenses are generally fixed, no matter the number of subscribers (there is not a direct correlation between subscriber counts and expenses)
- ◊ The yearly profits within industry standards (50% plus)

Final Thoughts

There are several options for Dresden to move forward- all are dependent on strong support from the select board, because all choices will require the participation (as a champion and as a financial supporter) to varying levels depending on the path forward.

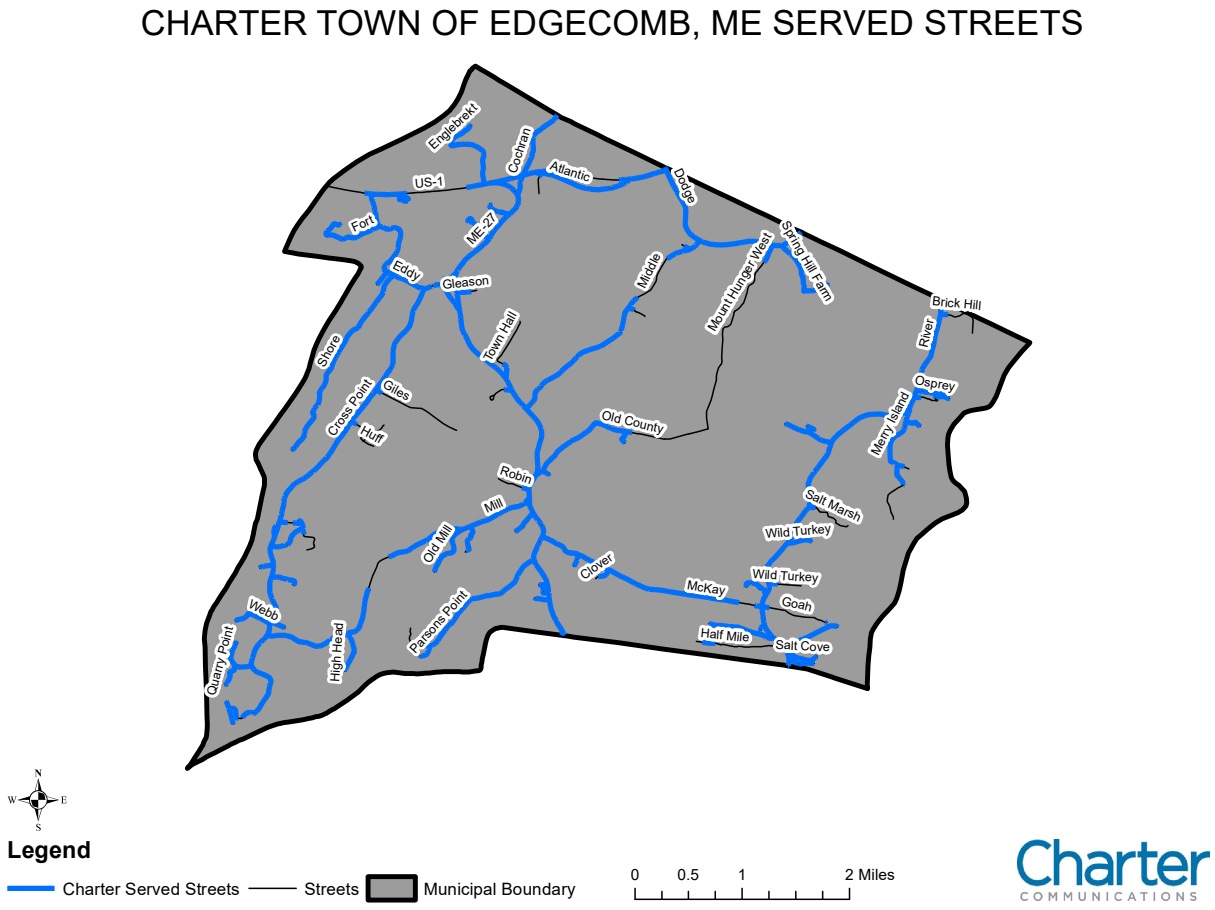
- Working with Spectrum or Consolidated is the least expensive, least risky option
  - Spectrum service offers cable TV, typically our surveys show high interest in TV service, making an expansion of Spectrum more attractive potentially
  - Consolidated expansion likely comes with some enhancements to those with Consolidated service now, but DSL technology is outdated and will be difficult and expensive to scale in the future

- Installing new Fiber optic system
    - State-of-the-art system that will last for at least 20 years or very likely much longer

    - Gives Dresden a competitive advantage
        - Attract new families
        - Build home-based businesses
        - Telehealth and educational opportunities
        - Options for cutting cord and cost savings on communications bill

Edgecomb

Edgecomb has good Spectrum (Charter Communications) coverage with very limited areas with no service or limited service. Below is Spectrum's coverage map. While likely not entirely accurate, working with Spectrum to expand their service into the few remaining areas without service is a good strategy for the community.
There likely are places that would be eligible for a ConnectME Infrastructure grant. Those grants are typically announced in March. If the town was interested in this approach, Axiom would recommend beginning to engage them now, well before the ConnectME grants become available.



One strategy to work with Spectrum would be to review the town's franchise agreement to ensure that there are not already provisions in that agreement that require Spectrum to cover every home. These are typically legacy agreements and the agreement could be well out of date and could be updated through a renegotiated agreement.

Another option for the town to consider would be to work with LCI, https://lcifiber.net, to expand fiber service in a limited way. We have not engaged LCI for this report, but they are more than willing to show the town the current service footprint in the community and you can then ask for pricing to expand the service if this is of interest.

Final Thoughts

- Edgecomb is in a good position to request limited expansion by Spectrum to cover the entire community
- If the town desires, LCI could expand fiber optic service in a limited way, if it makes sense to do so that would create a high capacity fiber corridor that could be used as an economic development tool

Both of these strategies require coordination with each provider:
Spectrum- Melinda Kinney at Melinda.Kinney@charter.com
LCI- Alan Hinsey at Alanh@lcifiber.net

Jefferson

During Phase I of the planning process, Axiom's analysis of Jefferson's overall internet coverage revealed a hodge-podge of coverage. Spectrum cable service does cover a portion of the town, Consolidated Communication's DSL service is available, but does not cover close to 25% of the town. Red Zone has a wireless system that covers some in the community, and others use satellite service or simply their phone- if they can get a strong enough cellular signal. There are many frustrated residents in the community and Jefferson returned the largest number of surveys- over 120, which is a strong indicator of dissatisfaction.

Current Service Provider: Consolidated Communications

Consolidated Communication service leaves a lot to be desired. Over 290 homes unserved (24.2%); 24.8% have service, but do not meet the federal standard of 25/3Mbps. The chart, provided by Consolidated, confirms the difficult situation that residents of Jefferson are feeling about their Internet service.

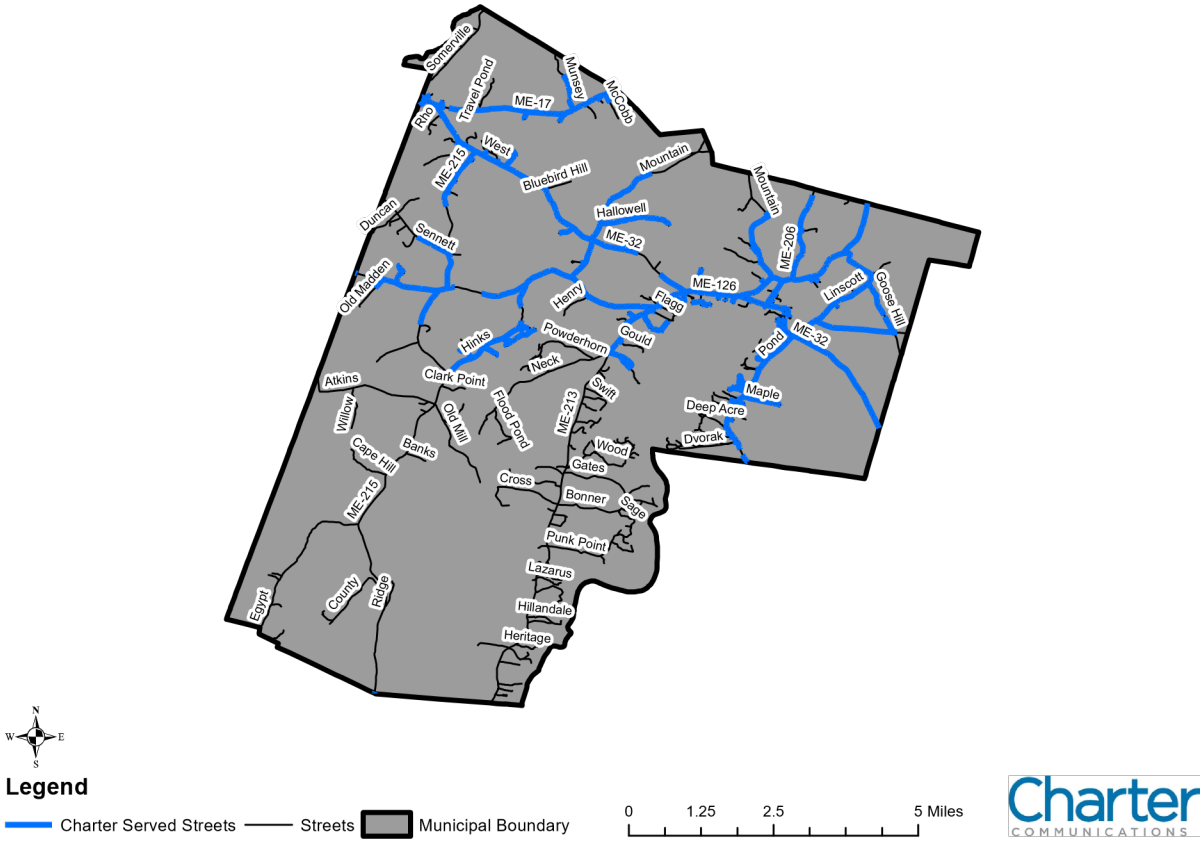
Speed/Bandwidth [Max Available]	# Locations	% available
768K/3M	38	3.2
7M	88	7.3
10M	172	14.3
20M	79	6.6
25/2M	443	36.8
40M	44	3.7
60M	3	.2
80M	44	3.7
NS	291	24.2
TOTALS	1202	100.0

Jefferson resident testimonial-
"The cost is high for my slow internet DSL [Consolidated] connection and the basic (no long distance) phone service. Cable TV is not available in my area of Jefferson, so I get TV via antenna connection."

Current Service Provider: Spectrum

Spectrum service covers approximately half of the community, typically covering only the most densely populated areas, as the company policy will not cover areas with less than 20 homes per mile. It's not clear if the town has a contractual franchise agreement with Spectrum. If so, the town is receiving some subsidy on a yearly basis and may be able to review the contract to understand better Spectrum's responsibility, if any, to bring expanded service to other parts of the community. The map provided by Spectrum is a reasonably accurate representation of the areas they cover.

CHARTER TOWN OF JEFFERSON, ME SERVED STREETS



Because of the number of roads not covered, it is unlikely that Spectrum would consider a major expansion, even with significant local dollars to pay for it.

One concern expressed was the cost, with one resident reporting that Spectrum service was costing them more than $175/month.

Other Service Providers:

Red Zone- Red Zone offers some service in limited areas and is not particularly well regarded. Because of the technology they are using to deliver service the limitations can severally impact user experience.

Red Zone testimonial-
"I had no service for two weeks this summer following storm. I had to leave my lake camp and return to VA"

Satellite and cellular- both are expensive, unreliable bordering on unusable at times for even the most basic of internet functions and should not be considered as satisfactory alternatives to a true Broadband connection.

The Plan

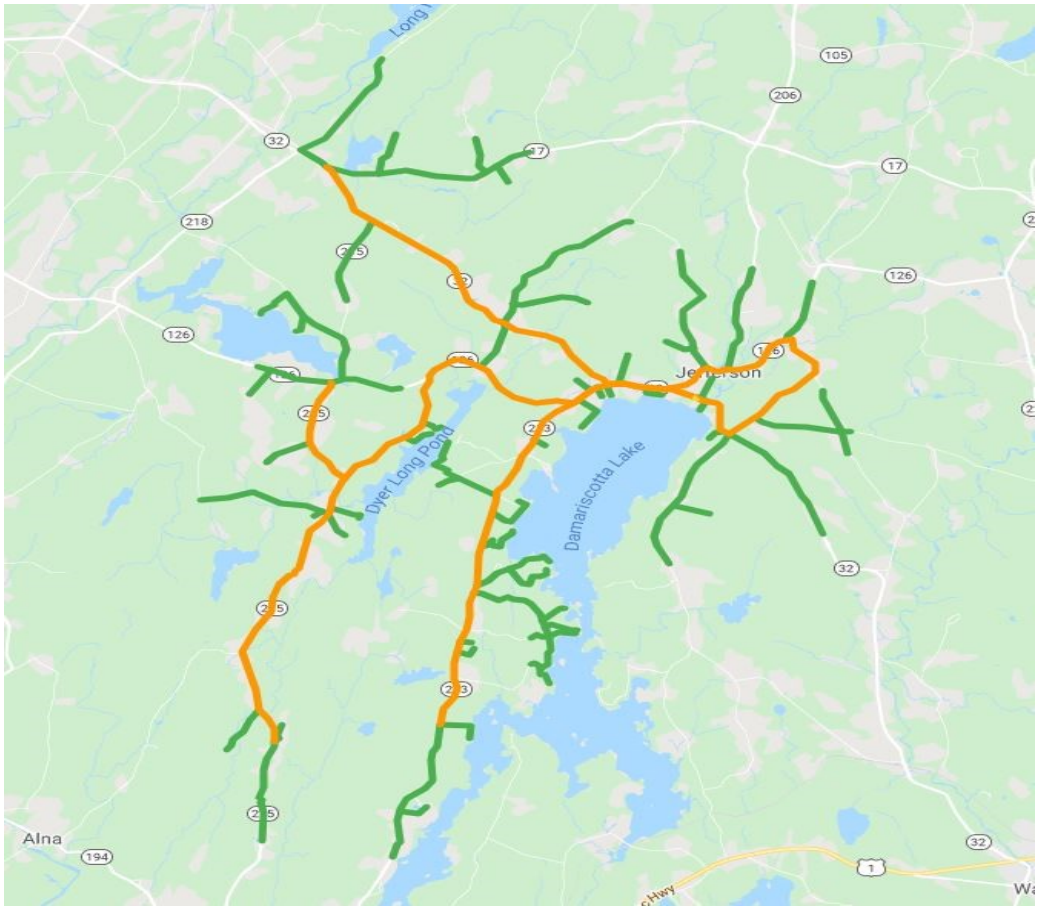
We recommend a full fiber optic plan for the community, including the areas currently covered by Spectrum. This would allow for the full benefits of fiber optics to help the community remain vibrant, attract young families and help Jefferson citizens build their own economy.

The plan would provide for:

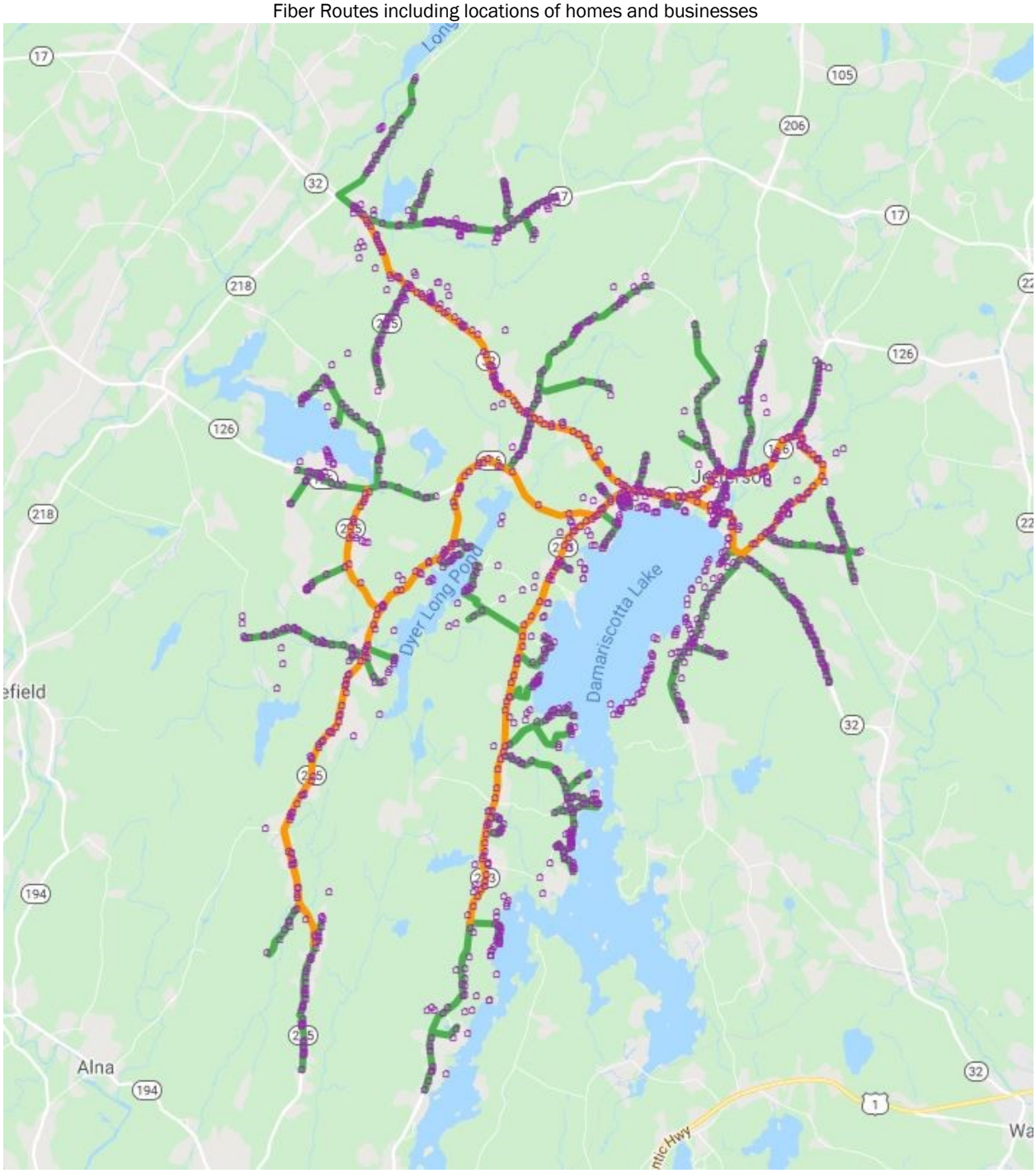
- Equal Access to All- Speed and Reliability would be consistent across the whole community
- Fast and Reliable- Fiber allows for unlimited speeds- to each house, while also providing best-in-class reliability
- Futureproof- while more expensive up front, because this technology is easily scalable, no reinvestment necessary for 20 years or more. This makes fiber the best choice- and least expensive option over time

Fiber Optic Cable routes

Orange= Trunk fiber: Green= Drop fiber

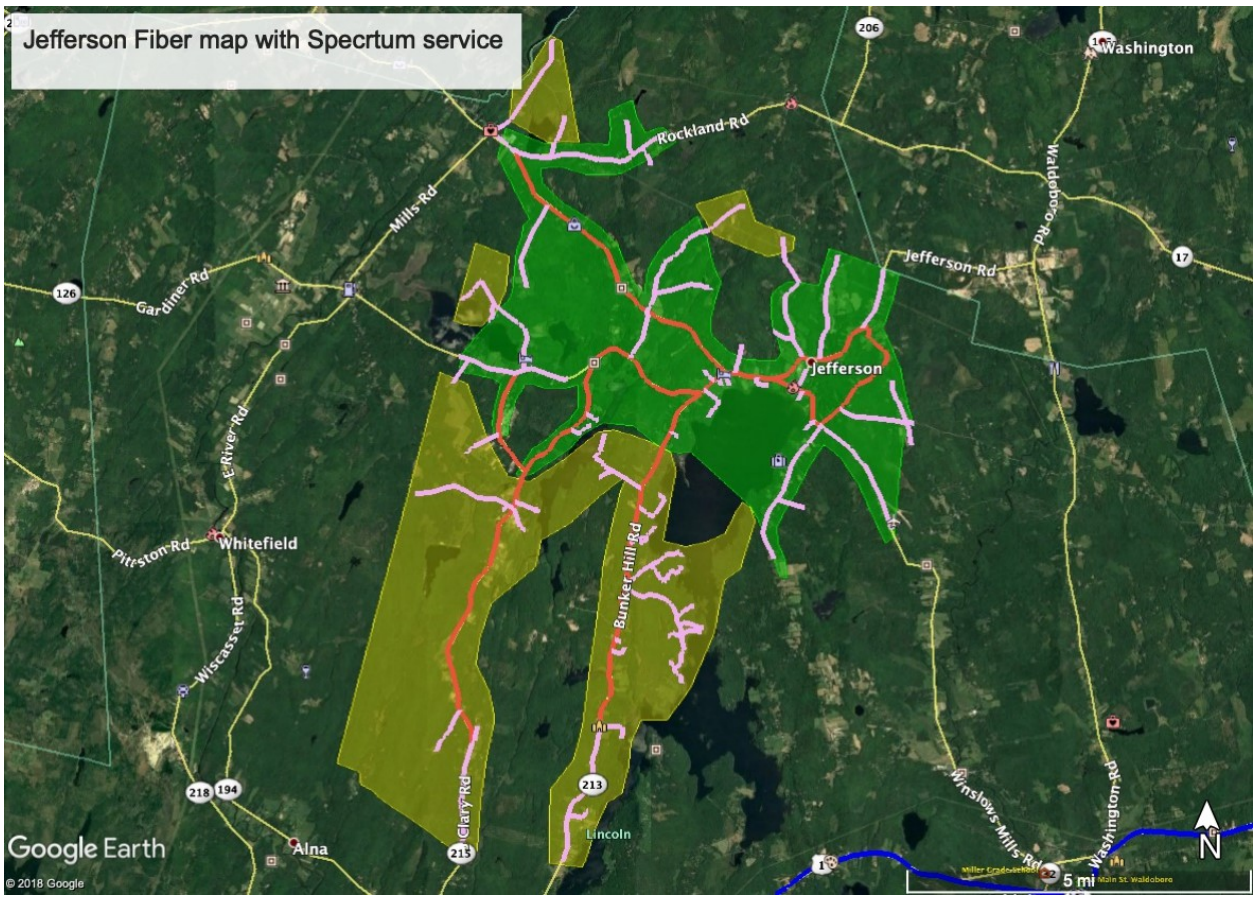


Fiber Routes including locations of homes and businesses



This is the same fiber map with E911 addresses added to give you a good visual of the density of homes across the community. The map does not depict each connection from the fiber to the individual homes. However, we have built into our pricing model connections to every home that wants service. Any home is capable of receiving a connection from this construction design.

To give you a good visual perspective on where service from Spectrum is and is not, we created this map. This can help you better understand the possibility of only building a system that would serve those areas most in need, or how much uncovered areas of the town there are, if you want to engage Spectrum in a conversation about the cost of expansion.



Green area= Covered by Spectrum
Yellow areas= Not Spectrum served

Cost

The projections for this project are based on a number of assumptions. Please remember, this is a desktop estimate and additional, significant work would need to be completed to give the community a final cost that eliminates all of the variables. The different cost components will give the reader a good idea of where estimated cost would possibly change.

Category Description		Cost
Bill of Materials		$3,166,532
Pole Licensing Application		$106,924
Utility Pole Make Ready	Estimate	$517,500

Utility Pole Replacement	Estimate	$690,000
CO/ Regen Hardware		$291,535
Customer Premise Drop Cable	Estimate	$156,970
Customer Premise Installation Labor		$1,070,250
Total		$5,999,711

The total cost of the budget contains several line items that may change and lower the cost of the project overall. A lot of additional costing information will be learned by proceeding with the pole licensing process. For example, we have made some assumptions based on past experience, but the true understanding of the costs associated with pole attachments and make ready - the cost of other users of the poles moving their lines to "make ready" a space for a new cable - only will come through the licensing process. In addition, pole replacement costs are estimated and will not be known till the pole make ready work is completed.

This budget contains the hardware for 100% of homes to be connected, however, we calculate a take rate of 40% in year one, which would reduce the up-front cost of customer premise installations by approximately $600,000. Along with other potential reductions, we would expect the cost of construction to be closer to $5M.

Breakdown of Cost Components

Bill of Materials
This is the materials and equipment cost for the whole project with the exception of CO/Regen Hardware & Installation and the cost of the drop cable, which are separate line items.

Pole Licensing Application
This plan requires the placement of fiber optic cabling to be placed on existing utility poles across the community. In order to receive approval, a several step process of several months is required, but begins with the application. The cost of the application is based on the number of utility poles you would like to attach to.

Utility Pole Make Ready
Make Ready is the cost of making the poles ready (make 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 the evaluation of each pole will take place during the pole licensing process.

CO/Regen Hardware & Installation
CO refers to Central Office, which is a term of art that Internet Service Providers use to describe where the equipment that would be needed to power the system and where the internet would be distributed from to each home. 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 Cable
This is an estimated cost of the fiber to connect each home from the street to the home.

Customer Premise Installations
These costs are associated with the equipment needed at each home. This is the cost of connection 100% of the homes.

Revenue and Expense Model

As part of Axiom's commitment to our mission to help rural communities more fully understand what ISPs are facing serving a small community, we have created a revenue and operational expense budget that helps the community and the ISP better negotiate an operating agreement through a Public-Private Partnership, should the community choose to own the fiber network.

It's important to understand that these are just an illustration of how Axiom would envision the feasibility of operating a system and what potential customer rates could look like. The potential revenue is based on service levels and take rates that are solely Axiom projections and are intended for illustration only, each provider would have their own revenue and cost models. However, these numbers can show you generally what a provider might expect if the town were to build a new fiber system and importantly, how much capital participation, if any, might be expected from the provider.

Revenue

Rate Group	# of Subscribers	Monthly Rate	Annual Revenue
25/5Mbps	400	$69.99	$335,952
50/10Mbps	114	$79.99	$109,426
100/20Mbps	57	$109.99	$75,233
Business Class-50/50M	5	$109.99	$6,599
TOTALS	576 (40%)		$520,611

- The Rate Groups and monthly cost are entirely Axiom's and may differ depending on provider
- Take rate is the estimated number of homes we believe would take service. In Jefferson's case we believe a 40% take rate is achievable- in year one, with a steady rise as people in town convert slowly from Spectrum and Consolidated.

Expenses

Yearly Operating Expenses			Yearly Cost
Bandwidth			$83,592
Phone Technical support			$7,455
Administrative support			$3,929
FC support (local)			$26,531
FC support (Remote)			$101,037
5% gross Rev returned to Community	(negotiated amount)		$26,031
	TOTAL		$248,575

Bandwidth is the cost of bulk wholesale internet.

Phone tech support is the estimated cost to maintain phone support for customers for the year.

Administrative Support is the cost of billing/collections and support for billing questions.

Local Field Crew is the cost of Axiom hiring a local person to conduct simple trouble shooting at the home. Field Crew (Remote) is the cost of dispatching FC from Machias to deal with more serious issues- breakage, splicing, etc.

Revenue return of 5% is Axiom's commitment to give 5% of Gross revenue- $26,031/year- back to the community for the life of any contract.

Three important takeaways of this section:

- How critical take rate is to the overall viability of the project (less subscribers, less opportunity for profits)- In the case of Jefferson, the number of homes would be attractive to a provider
- The monthly operating expenses are generally fixed, no matter the number of subscribers (there is not a direct correlation between subscriber counts and expenses)
- The yearly profits within industry standards (50% plus)

Final Thoughts

- Jefferson is large enough to attract an outside provider
  - If LCI is interested in serving Jefferson that is a partnership worth exploring
- Given that Spectrum serves half of the town, you could build a solution that serves only the unserved and underserved portion of the town ○ It's possible that the underserved portion of the community could be eligible for a USDA ReConnect grant- worth exploring
- Expanding Spectrum service is a viable option, but unlikely given the scale of the expansion
  - Expensive
  - Requires a significant public subsidy for a private company to own the expanded infrastructure

Somerville

There are several ingredients that can make a Broadband expansion possible. One of the most indispensable of those ingredients is to have champions that will drive the process. Somerville has such a group of champions and are holding regular BB meetings in the community. Inviting providers, soliciting feedback from town citizens and reporting to the community and select board about the committee's vision, this group is passionate about finding a solution to this pressing problem.

One unique and difficult problem to overcome is that Spectrum cable service does not provide its service anywhere in the community. Unlike the other six communities in the planning process, this likely means that they will have to build ubiquitous service across the whole community. The plans below reflect that reality.

Current Service Provider: Consolidated Communications

Consolidated service is uneven, leaving much of the community with less than adequate service. The chart below, provided by Consolidated confirms what citizens are feeling.

Speed/Bandwidth [Max Available]	# Locations	% available
768K/3M	71	20.7
7M	57	16.6
10M	77	22.4
20M	28	8.2
25/2M	43	12.5
40M	11	3.2
60M	1	.3
80M	25	7.3
NS	30	8.8
TOTALS	343	100.0

Out of a total of 343 homes, almost 9% (30) homes are unserved and 60% (205) homes do not meet the 10/1Mbps standard- a standard, well below the FCC standard of 25/3Mbps.

Only 23% of residents can achieve close to the 25/3Mbps or above the FCC federal standard.

As the internet becomes more and more integral to the lives of rural Mainers, Consolidated coverage is less than optimal.

Current Service Provider: Others

There are only two other choices which are expensive and unreliable. Using your phone to access the internet or buy satellite service. As one Somerville resident described the current situation:

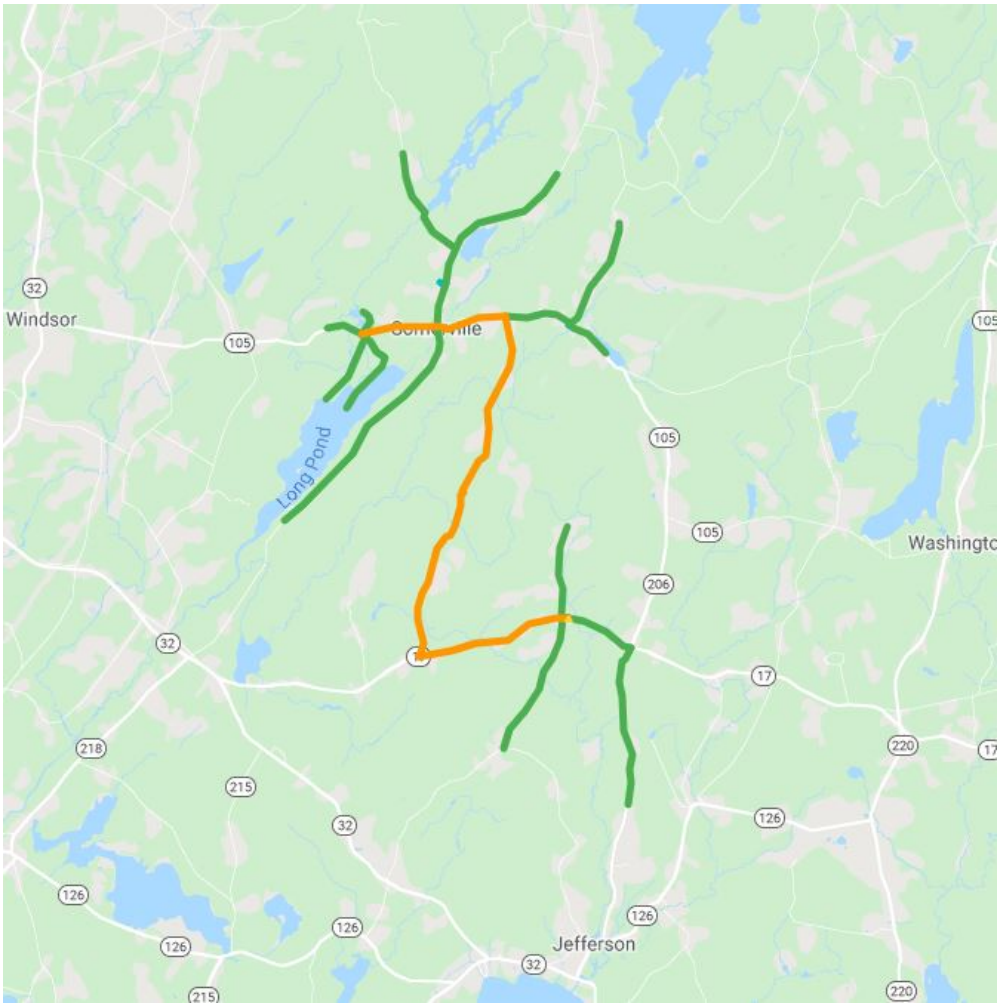
"*It's still slow, despite the fact that I have opted for a more costly plan. There are NO choices in my town.*"- A Consolidated Customer testimonial from Somerville.

The Plan

The plan we recommend is fiber optics and is capable of reaching every home in Somerville, and regardless of their location would be able to receive the same level of reliability and service as anyone else in the community.

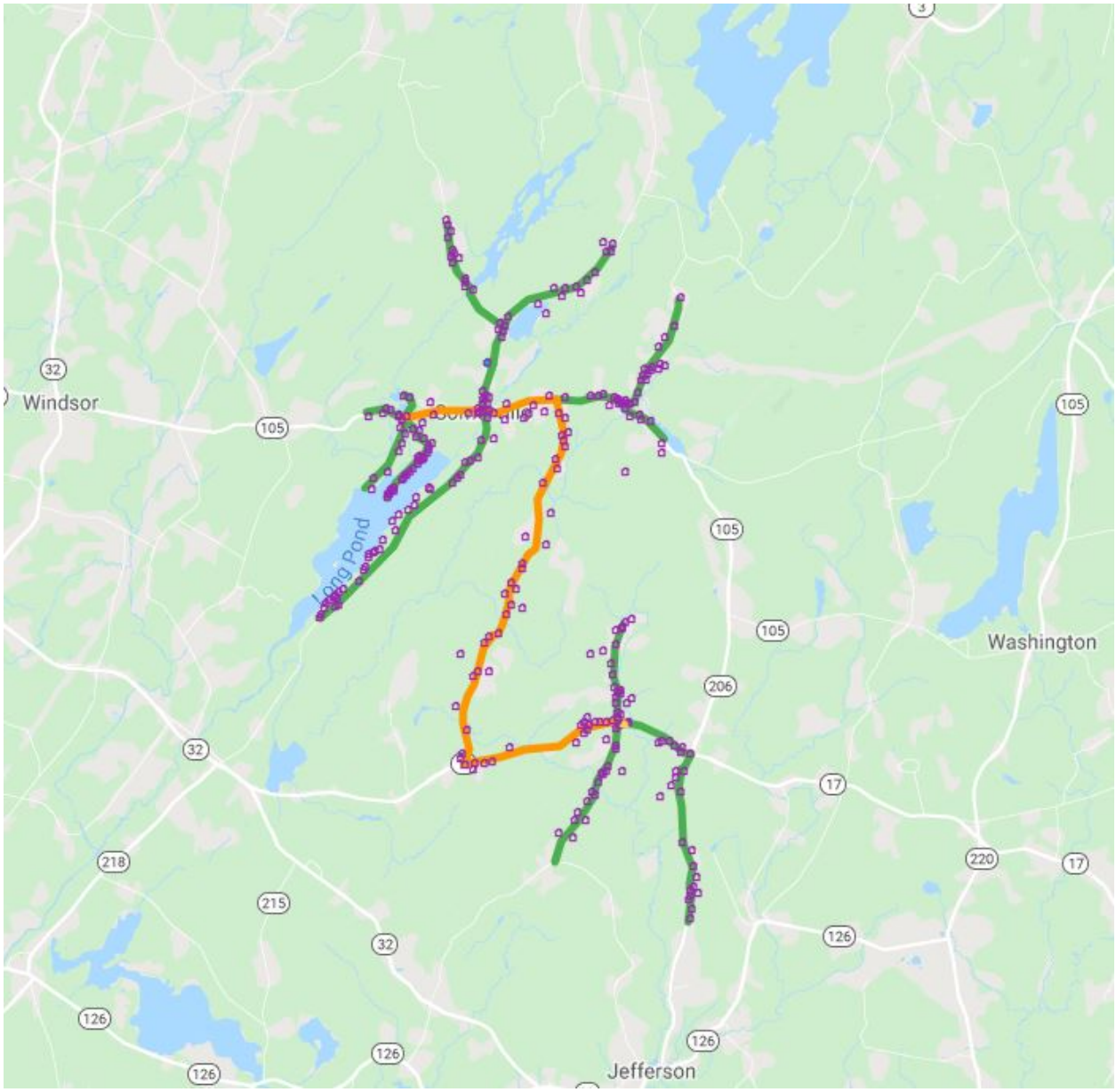
- Equal Access to All- no matter where you live in Somerville your home would have access to the same speeds and reliability as any other resident
- Fast & Reliable- The system would be built to withstand fluctuations in demand, would deliver lightning fast speeds and use the most reliable technology on the market
- Futureproof- This technology would allow Somerville to never fall behind again, with little to no upgrades to the system over the next 20 plus years

The map does not depict each connection from the fiber to the individual homes. However, we have built into our pricing model connections to every home that wants service. Any home is capable of receiving a connection from this construction design.



Somerville Fiber routes
Orange line= High Count Fiber Trunk Line- Green lines depict lower count Drop Lines

Fiber Lines with homes



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Cost

The projections for this project are based on a number of assumptions. Please remember, this is a desktop estimate and additional, significant work would need to be completed to give the community a final cost that eliminates all of the variables. The different cost components will give the reader a good idea of where estimated cost would possibly change.

Category Description		Cost
Materials		$761,412
Pole Licensing Application		$32,039
Utility Pole Make Ready	Estimate	$167,625
Utility Pole Replacement	Estimate	$223,500
Regen Hardware		$109,058
Customer Premise Drop Cable	Estimate	$33,110
Customer Premise Installations		$225,750
Total		$1,552,493

The total cost of the budget contains several line items that may change and lower the cost of the project overall. A lot of additional costing information will be learned by proceeding with the pole licensing process. For example, we have made some assumptions based on past experience, but the true understanding of the costs associated with pole attachments and make ready - the cost of other users of the poles moving their lines to “make ready” a space for a new cable - only will come through the licensing process. In addition, pole replacement costs are estimated and will not be known till the pole make ready work is completed.

Additionally, a contingency budget has not been included with this budget to account for unforeseen construction cost overruns.

Breakdown of Cost Components

Material

The materials line item is the cost of all materials and equipment required for the construction of the project, less the Regen hardware and Customer Drop cable which have separate line items.

Pole Licensing Application

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Utility Pole Make Ready

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CO/Regen Hardware & Installation

CO refers to Central Office, which is a term of art that Internet Service Providers use to describe where the equipment that would be needed to power the system and where the internet would be distributed from to each home. 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 Cable

This is an estimated cost of the fiber to connect each home from the street to the home.

Customer Premise Installations

These costs are associated with the equipment needed at each home. This is the cost of connection 100% of the homes.

Revenue and Expense Model

As part of Axiom's commitment to our mission to help rural communities more fully understand what ISPs are facing serving a small community, we have created a revenue and operational expense budget that helps the community and the ISP better negotiate an operating agreement through a Public-Private Partnership, should the community choose to own the fiber network. It's important to understand that these are just an illustration of how Axiom would envision the feasibility of operating a system and what potential customer rates could look like. The potential revenue is based on service levels and take rates that are solely Axiom projections and are intended for illustration only, each provider would have their own revenue and cost models. However, these numbers can show you generally what a provider might expect if the town were to build a new fiber system and importantly, how much capital participation, if any, might be expected from the provider.

Rate Group	# of Subscribers	Monthly Rate	Annual Revenue
25/5Mbps	148	$69.99	$124,302
50/10Mbps	42	$79.99	$40,315
100/20Mbps	21	$109.99	$27,717
Business Class-50/50M	5	$109.99	$6,599
TOTALS	211 (70%)		$192,335

- The Rate Groups and monthly cost are entirely Axiom and may differ depending on provider
- Take rate is the estimated number of homes we believe would take service. In Somerville's case we believe a 70% take rate is achievable- this makes the project more viable.

Expenses

Yearly Operating Expenses			Yearly Cost
Bandwidth			$27,864
Phone Technical support			$2,755
Administrative support			$1,452
FC support (local)			$9,804
FC support (Remote)			$37,336
5% gross Rev returned to Community	(negotiated amount)		$9,617
	TOTAL		**$88,828**

Bandwidth is the cost of bulk wholesale internet.
Phone tech support is the estimated cost to maintain phone support for customers for the year.
Administrative Support is the cost of billing/collections and support for billing questions.
Local Field Crew is the cost of Axiom hiring a local person to conduct simple trouble shooting at the home.
Field Crew (Remote) is the cost of dispatching FC from Machias to deal with more serious issues- breakage, splicing, etc.
Revenue return of 5% is Axiom's commitment to give 5% of Gross revenue- $9,617/year- back to the community for the life of any contract.

Three important takeaways of this section:

- ◊ How critical take rate is to the overall viability of the project (less subscribers, less opportunity for profits)
- ◊ The monthly operating expenses are generally fixed, no matter the number of subscribers (there is not a direct correlation between subscriber counts and expenses)
- ◊ The yearly profits are below industry standards

Final Thoughts

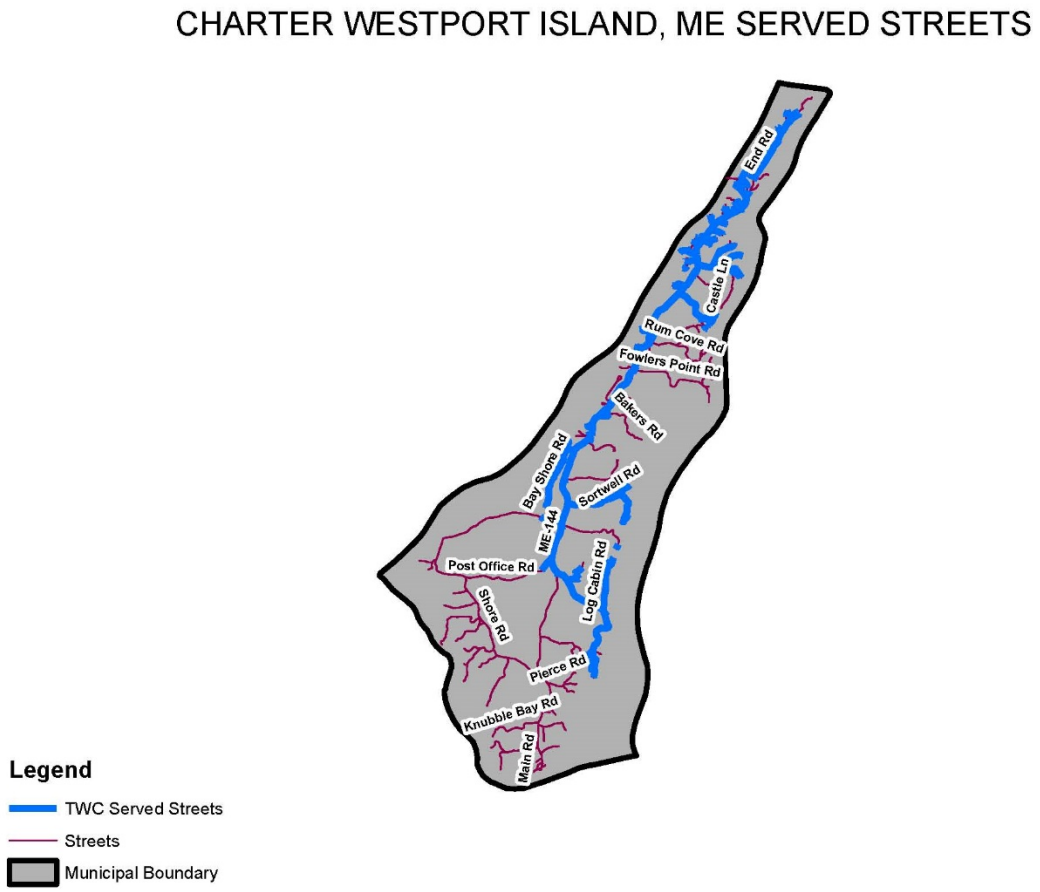
- Fiber Optics is the only solution for Somerville
  - Building upon Consolidated old copper and limited DSL capabilities is not a viable solution
- Given the small number of homes, a significant public subsidy will be required to achieve success
- If owning the internet system is an important goal this will limit the number of ISPs who will work with you
- A regional approach may be viable to reduce costs and risks, but the amount of effort and time for such an approach would be years away- are citizens willing to wait?
- The town might want to consider a USDA grant for those homes that have less than 10/1Mbps service from Consolidated- able to discuss pros and cons when ready

Westport Island

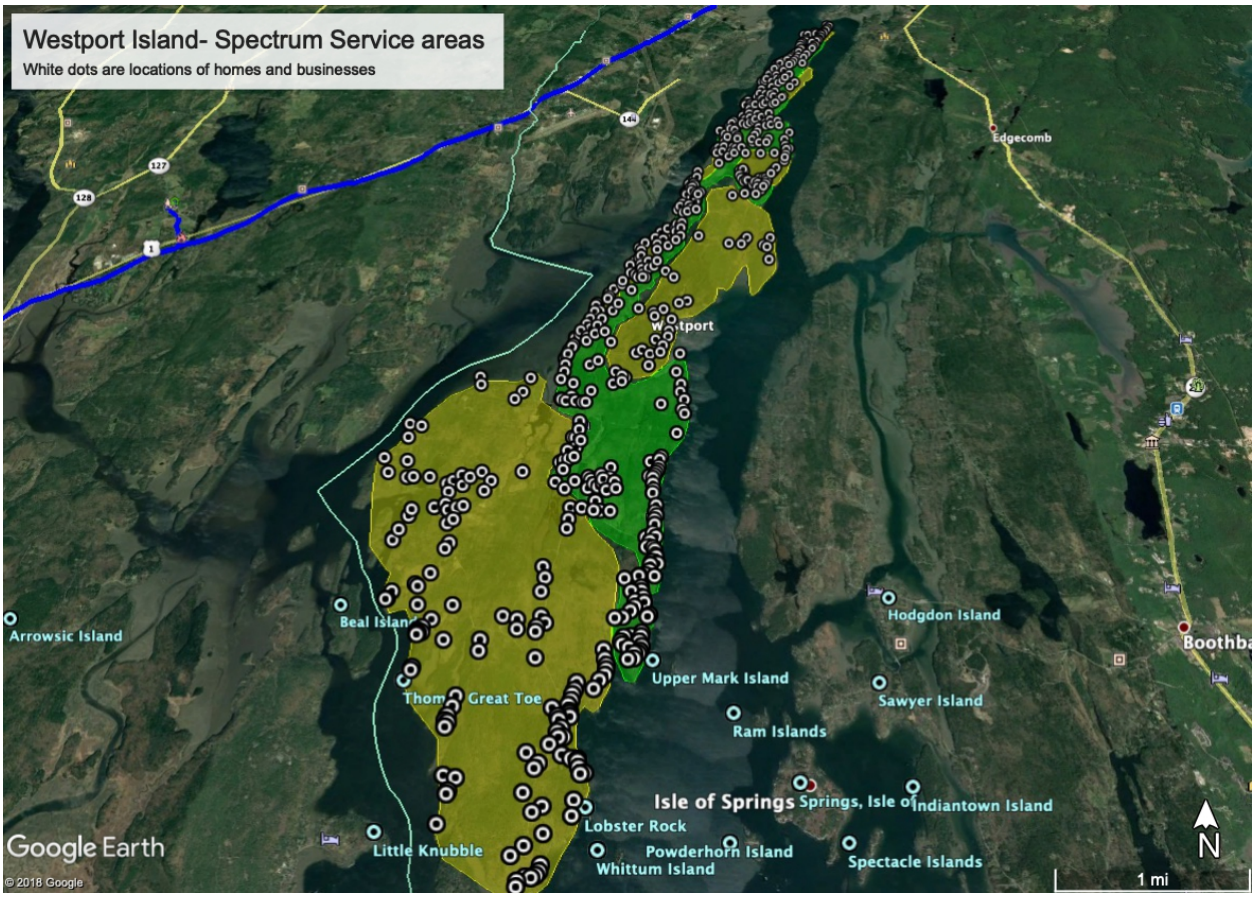
The Westport Island Broadband Committee has already done significant work considering their options for better internet connectivity. Working to partner with Spectrum (Charter Communications) to expand their operational footprint was unfortunately delayed when the required data from Spectrum was not supplied in timely manner and the deadline for a ConnectME grant was missed. Given the significant work of the Committee to engage Spectrum, another attempt seems prudent, especially given that the information needed is in hand and can be used to complete the grant application well in advance.

However, since that first attempt to engage Spectrum, a growing interest to invest in fiber optics system that would cover the whole community with world-class speed and reliability has emerged as a potential option. This approach would solve the situation in areas not covered by Spectrum, while bringing an alternative service and choice to residents. Axiom has created a fiber optic construction budget that would cover every home with accompanying operations revenue and expense modeling, to help the town make a decision about their approach moving forward: Spectrum expansion or a new fiber optic installation.

Spectrum Plan



Spectrum service covers the majority of homes in the community, in the most densely populated areas, while leaving a good amount of the island unserved or underserved by Consolidated Communications. It seems unlikely that Spectrum would consider a large expansion into areas that they themselves have determined to be unprofitable. However, if the town were able to secure a significant subsidy to cover the majority of the community, this might heighten the interest of Spectrum.



Green areas= currently covered by Spectrum
Yellow areas= No Spectrum service

Working with Spectrum to price out the areas currently unserved by Spectrum to help the Broadband Committee and Select Board better understand the cost and size of the problem would help determine how much subsidy would be required to build out cable service to every home. This could them be compared to the cost of creating a municipally owned fiber optic system.

Fiber Optic Plan

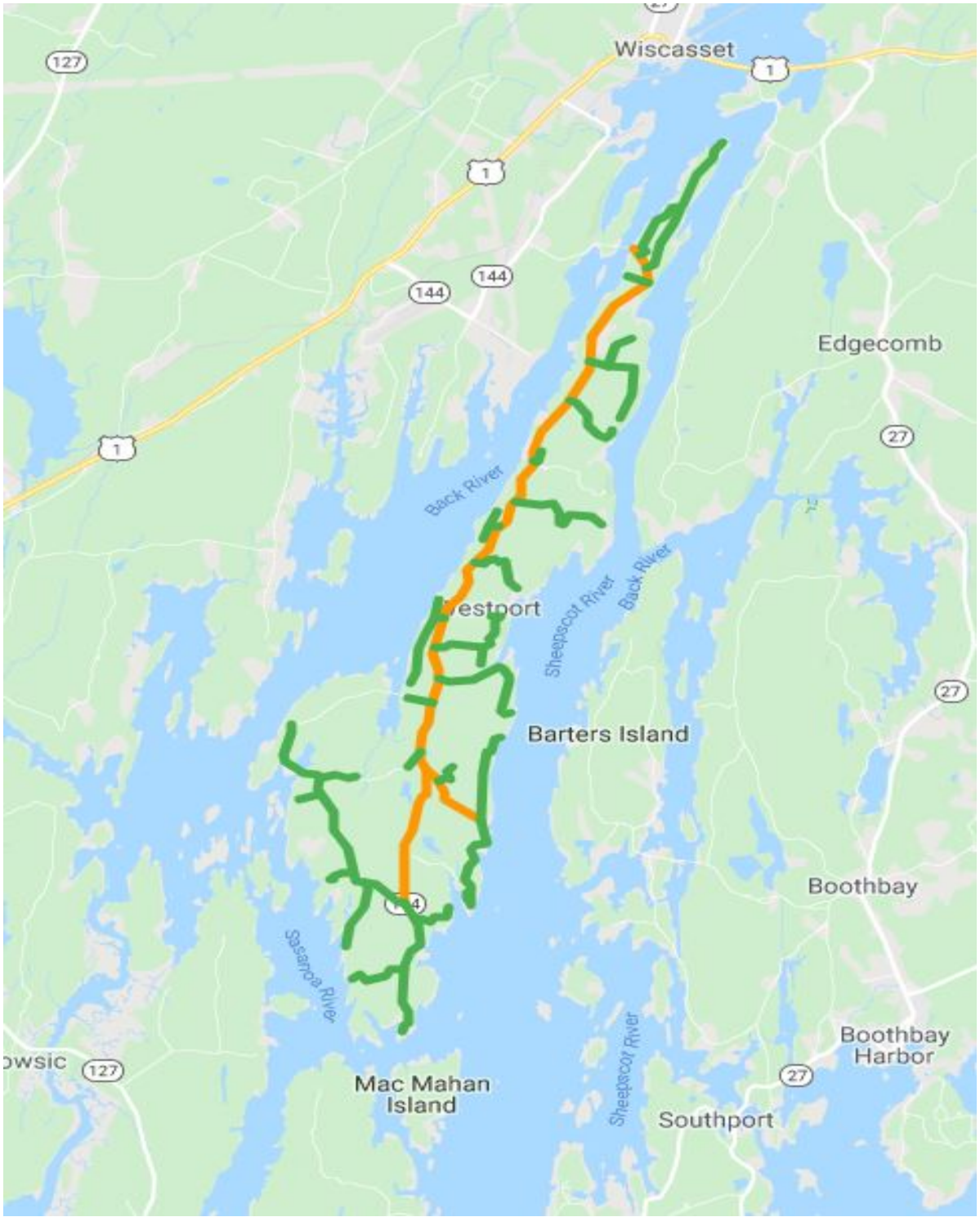
Expanding Spectrum service is a good option, but communities can be uncomfortable investing in privately owned infrastructure. In addition, Spectrum service, while superior to Consolidated Communications DSL or satellite service still brings limitations and can be frustratingly unreliable at times. Spectrum's delivery system gets taxed at high use times during the evening, and users often

experience degraded service during those times. The Westport Broadband committee recognizes these limitations and has asked that Axiom put together a plan to bring world-class fiber optics to the community. The intention of this section is not just to price out the cost of constructing such a system, but to also work through a model that would have the revenue generated by subscribers to the new system cover the cost of a bond or low-interest low that the municipality would back. The vision would be that any new system installation would not be taxpayer funded. When there is a market failure, and the private sector fails to provide the demanded service, many towns are increasingly taking matters into their own hands. Across Maine, a handful of communities have installed their own systems and contracted with an ISP to operate the publically owned system. The Institute for Social Self-Reliance has many examples of successful broadband initiatives across the United States as well as resources that can help guide community thinking. They have a Community Broadband Network page located at: https://ilsr.org/broadband/.

The Fiber system we propose would provide:

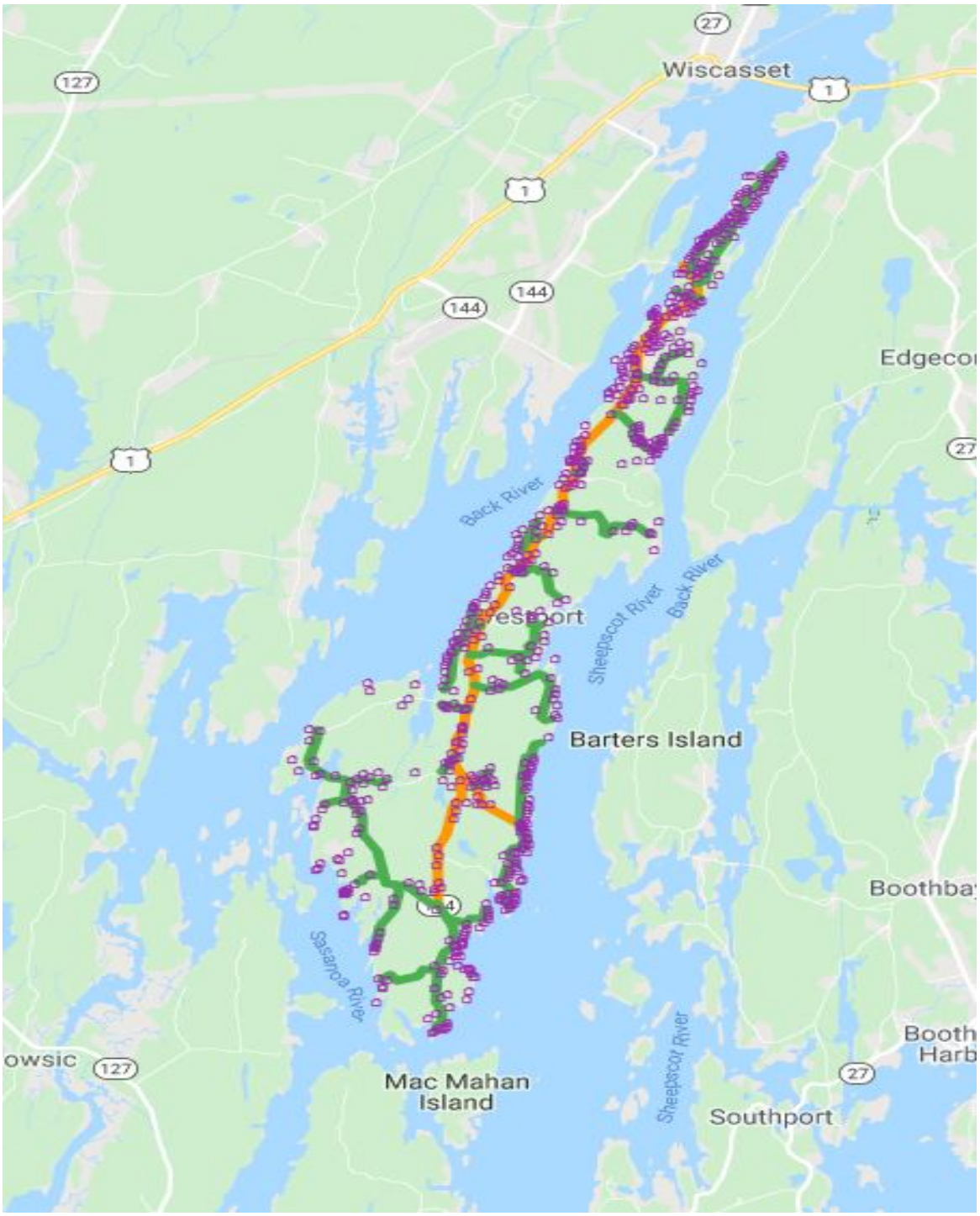
- Equal Access to All- no matter where you live on Westport Island your home would have access to the same speeds and reliability as any other resident
- Lightning Fast Speed & State of the Art Reliability- The system would be built to withstand fluctuations in demand, would be capable of delivering up to a Gigabyte (1000Mbps) to each premise and use the most reliable technology on the market
- Symmetrical Service- A fiber optic system allows for same download and upload speeds
- Futureproof- This technology would allow Westport to never fall behind again, with little to no upgrades to the system over the next 20 plus years

Fiber optic cable path



Orange= High Count trunk fiber
Green= Lower Count drop fiber

Fiber path with homes



This is the same fiber map with E911 addresses added to give you a good visual of the density of homes across the community. The map does not depict each connection from the fiber to the individual homes. However, we have built into our pricing model connections to every home that wants service. All homes would be capable of receiving a connection from this construction design.

Cost

Category Description		Cost
Bill of Materials		$1,112,749
Pole Licensing Application		$32,914
Utility Pole Make Ready	Estimate	$173,025
Utility Pole Replacement	Estimate	$230,700
Regen Hardware		$242,655
Customer Premise Drop Cable	Estimate	$66,330
Customer Premise Installations		$452,250
Total		$2,310,623

The total cost of the budget contains several line items that may change and lower the cost of the project overall. A lot of additional costing information will be learned by proceeding with the pole licensing process. For example, we have made some assumptions based on past experience, but the true understanding of the costs associated with pole attachments and make-ready - the cost of other users of the poles moving their lines to "make-ready" a space for a new cable - only will come through the licensing process. In addition, pole replacement costs are estimated and will not be known till the pole make ready work is completed.

This budget contains the hardware for 100% of homes to be connected, however, we calculate a take rate of 50% in year one, which would reduce the up-front cost of customer premise installations by approximately $250,000. Along with other potential reductions, we would expect the cost of construction to be $2M or less.

Breakdown of Cost Components

Bill of Materials
This category is materials and equipment cost for the entire project, minus the CO/Regen Hardware & Installation and the cost of drop cable, which are separate line items in the budget.

Pole Licensing Application
This plan requires the placement of fiber optic cabling to be placed on existing utility poles across the community. In order to receive approval, a several step process of several months is required, but begins with the application. The cost of the application is based on the number of utility poles you would like to attach to.

Utility Pole Make-Ready
Make-Ready is the cost of making the poles ready (make 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 the evaluation of each pole will take place during the pole licensing process.

CO/Regen Hardware & Installation
CO refers to Central Office, which is a term of art that Internet Service Providers use to describe where the equipment that would be needed to power the system and where the internet would be distributed from to each home. 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 Cable
This is an estimated cost of the fiber to connect each home from the street to the home.

Customer Premise Installations
These costs are associated with the equipment needed at each home. This is the cost of connection 100% of the homes.

Revenue and Expense Model

A critical component to considering a new fiber optic system would be to explore how the construction of the system would be paid for.

As part of Axiom's commitment to our mission to help rural communities more fully understand what ISPs are facing serving a small community, we have created a revenue and operational expense budget that will help the Broadband Committee and the select board better understand the feasibility of this approach.

It's important to understand that these are just an illustration of how Axiom would envision operating a system and what potential customer rates could look like. The projected revenue is based on service levels and take-rates that are solely Axiom's and are intended for illustration only. Each provider would have their own revenue and expense models.

Revenue

Rate Group	# of Subscribers	Monthly Rate	Annual Revenue
25/5Mbps	148	$69.99	$124,302
50/10Mbps	42	$79.99	$40,315
100/20Mbps	21	$109.99	$27,716
Business Class-50/50M	5	$109.99	$6,599
Seasonal		**Yearly rate**	
25/5Mbps	64	$713.99	$45,695
50/10Mbps	18	$815.99	$14,687
100/20Mbps	9	$1121.99	$10,098

	307 (50%)		**$269,412**

- The Rate Groups and monthly cost are entirely Axiom's and may differ depending on provider
- Take-rate is the estimated number of homes we believe would take service. In Westport Island's case we believe a 50% take-rate is achievable- , slowly adding customers over the first 5 years of operation as people in town convert slowly from other providers..

Expenses

Yearly Operating Expenses			Yearly Cost
Bandwidth			$55,728
Phone Technical support			$3,943
Administrative support			$2,078
FC support (local)			$14,032
FC support (Remote)			$53,438
	TOTAL		**$129,219**

Bandwidth is the cost of bulk wholesale internet.
Phone tech support is the estimated cost to maintain phone support for customers for the year.
Administrative Support is the cost of billing/collections and support for billing questions.
Local Field Crew is the cost of Axiom hiring a local person to conduct simple trouble shooting at the home. Field Crew (Remote) is the cost of dispatching Field Crew from Machias to deal with more serious issues- breakage, splicing, etc.

Two important takeaways of this section:

- ◊ How critical take-rate is to the overall viability of the project (less subscribers, less chance that the system can pay for itself through subscriber revenue
- ◊ The monthly operating expenses are generally fixed, no matter the number of subscribers (there is not a direct correlation between subscriber counts and expenses)

Financial Model

Cost to Borrow

For the purpose of this section we suggest using $2M as the borrowed figure, a 3% interest rate and a 10-year, 15-year or 20-year payback to help understand the cost of borrowing compared to projected revenue and expenses of delivering service and operating the system.

Term-$2M Loan/Bond		Monthly Payments	Annual payment
20 Years at 3%		$11,091.95	$133,103.42
15 Years at 3%		$13,811.63	$165,739.59
10 Years at 3%		$19,312.15	$231,745.79

Estimated Revenue	307 (50%)		$269,412/annually

Estimated revenues can cover the cost of a low interest loan. This model estimates the take-rate at 50%, so depending on the number of subscribers, the amount available for payback will vary.

If you assume that an Internet Service Provider will need to operate and manage the system and do all of the billing and servicing of customers, that cost, and just as importantly, roles and responsibilities, will need to be negotiated. Depending on how the model for ownership is developed, the expense to operate the system may be evaluated more closely, but our modeling can give you a good example of the expenses that a municipally owned system would be responsible for.

Estimated ISP Expenses			$129,219/annually

There is a lot to investigate here, including what level of profit an ISP might expect to operate a system of this size. The bottom line is that a negotiated monthly payment to an operator would need to be negotiated and the ISP would need to cover the cost of operation and some level of profit. As the Broadband Committee considers this approach three areas of focus will help further evaluate Axiom's assumptions.

- Construction Cost- the cost of constructing the system cannot be fully known until additional due diligence is undertaken
    - The committee working with Axiom can get a better idea of the assumptions in our construction cost analysis
    - Sending out an RFP for construction is recommended to create a competitive environment for the construction of the system
- Internet Service Provider- Better understanding the Revenue and Expense modeling will help the Committee arm themselves to better negotiate with an ISP
    - Assumptions of revenue and expenses likely change depending on the ISP
        - Choosing an ISP through RFP may also help evaluate each responders capabilities and willingness to work with the town
- Revenue Modeling is absolutely crucial to assess the risk of a project
    - Forensic analysis of Axiom assumptions will help the Committee model different subscriber rates and take rates to better assess viability

Final Thoughts

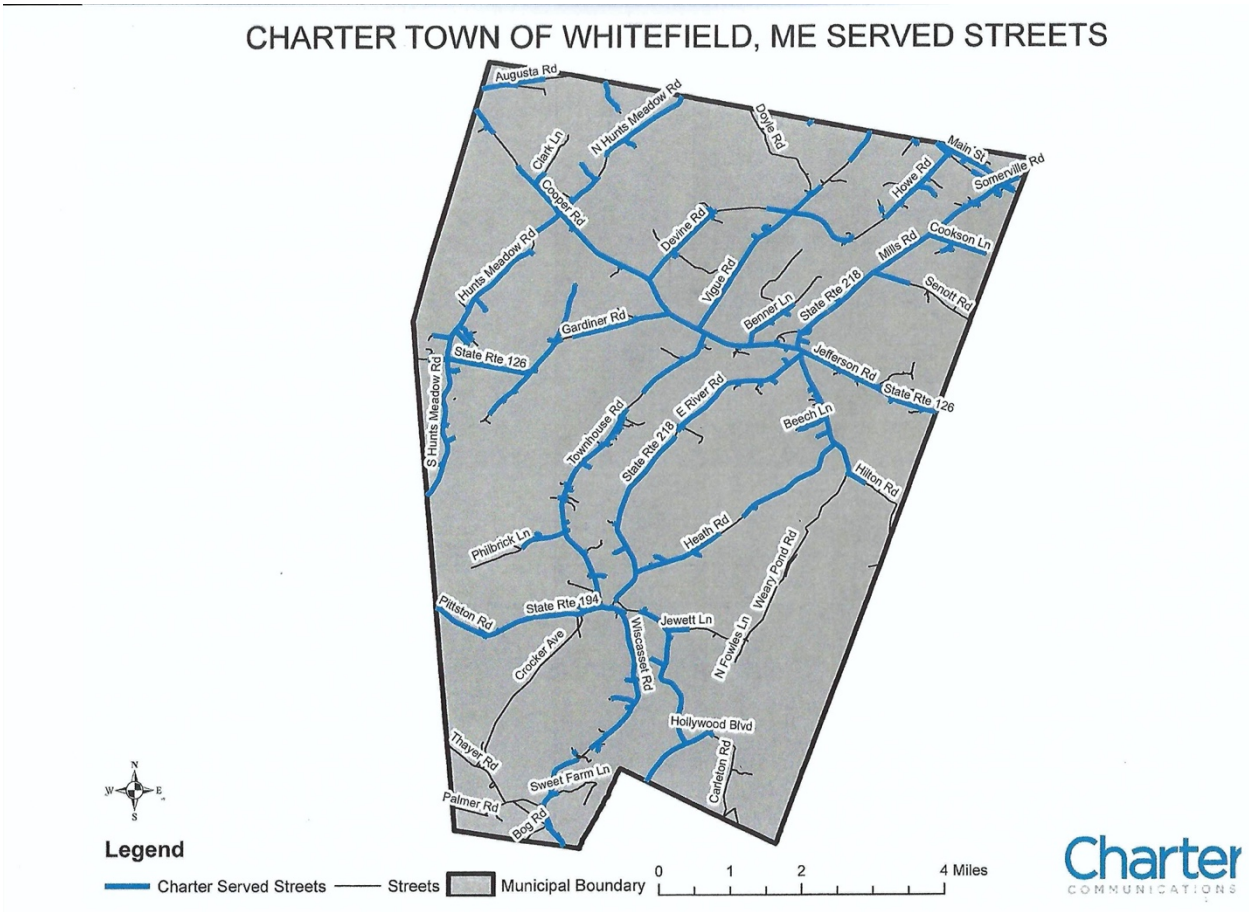
- Further investigate a no-cost taxpayer model for Fiber optic system
    - Capital Funding options
    - Revenue Model/Ownership
    - ISP attraction

- Spectrum expansion should be considered to areas most critically in need of better service
    - ConnectME infrastructure grants available in Spring of 2020
    - Unclear if Spectrum would undertake a full expansion across all areas currently unserved
    - Cost for full Spectrum expansion unknown

Whitefield

Whitefield has a robust and active broadband committee that have been gathering information and meeting with a number of providers over the past few years. The difficulty in Whitefield may be the lack of political will to move a project forward. With the majority of the community covered by Spectrum, most residents can get good internet service. However, there are areas that are unserved and those areas that have been most concerning to the broadband committee.

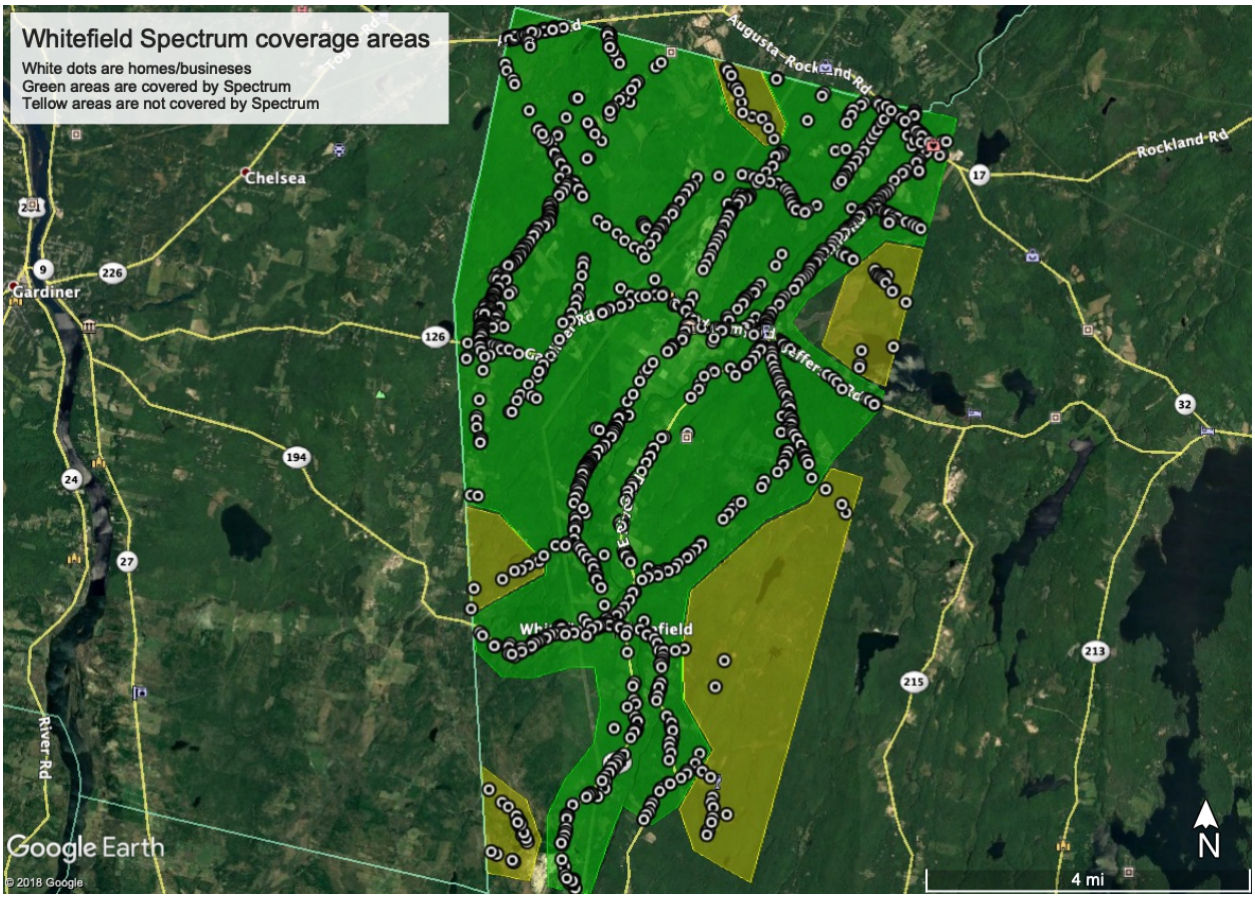
Spectrum Service Areas



The Committee has had ongoing conversations with Spectrum about expanding their service. A conversation recently with a Spectrum representative and Axiom indicates Spectrum is willing to move a project forward This is the most cost efficient and viable way forward. It is likely that some of the uncovered areas would be eligible for a ConnectME grant that would cover part of the cost. If the Committee is serious, its next step would be to obtain pricing from Spectrum for specific areas of coverage.
Shelly Winchenbach is the primary contact to continue conversations at Shelley.Winchenbach@charter.com.

Is a Fiber optic solution feasible?

Because there has been so much talk of fiber optic service being the gold standard, we did some investigating into the possibility of fiber service being provided either to those areas currently not served by Spectrum or a full build out of fiber over the entire town as an alternative competitor to Spectrum service. Both options are not viable without significant public subsidy.



The yellow areas are the parts of the community not covered by Spectrum. We count approximately 75 homes across these areas. There are several issues with building a fiber solution to serve these areas. In those areas unserved, we would expect a 70% take rate for service, suggesting that just over 50 homes would take service. This is a small number of homes.

First, the areas are not contiguous, and would require attaching them with fiber cable across areas that are covered by Spectrum. Technically, this is not an issue at all, and it would increase the number of homes passed, possibly increasing the take rate for service, if the cost of that internet service was comparable with Spectrum. However, by having to connect all of the areas, the cost increases exponentially, and with the likely initial take rate in the Spectrum areas low, this is not an optimal solution.

Second, the areas in yellow cover only about 75 homes. This is not enough scale to attract an internet provider, even if there was public money to build out to all of these homes.

Third, this would exacerbate the inequity in service levels, essentially giving those in the yellow areas better service than those in the Spectrum service areas, reversing the current situation. These types of partial solutions do not fare well at town meetings or with decision makers at the select board.

HotSpots

Community HotSpots are open access networks that allow citizens in your downtown or other public spaces access to the internet. This is a simple, straightforward way to get your community connected.

Axiom is a leader in deploying HotSpots and working with communities to get the most of these low-cost investments and have installed and supported deployments in over 10 communities. Communities continue to install HotSpots across the state and have found them to be utilized extensively, attracting 1000s of users a month.

- Allow people to access email and other smartphone tools in a faster, more efficient manner- without using their cellular data plan
- Supports connectivity to computers and tablets, not just cell phones
- Allows the community to advertise important community amenities
  - Public Restroom locations
  - Marina or portage locations
  - Food and tourism related attractions
- Supports citizens that do not have ready access to the internet
- Great for local sponsorships to defer cost

Cost of Installing a HotSpot

Axiom charges $3500 for the first HotSpot and $3000 for each additional HotSpot. Beyond the engineering and mapping of possible sites, this includes a one year equipment replacement warranty, unlimited phone and on-site technical support and monthly usage reports.

What is not included in this fee is the cost of the internet connection, estimated to be $65- $110/month, the electrical cost to power the HotSpot, estimated to be less than $10/month. Also not included would be any electrical work necessary to bring power to the location of the network equipment.

After the first year, Axiom management services are $1250/year. This fee includes unlimited repair or replace of equipment and monthly usage reports.

In many of our installations the community was able to attract grants and sponsors to defer the cost of installation or the cost of ongoing support that start in the second year.

Most recently, Monson was awarded a $7,000 grant from the Maine Community Foundation to install downtown Hotspots; in Millinocket they attracted a local foundation and GWI gave them free internet in exchange for a contract to serve the town office. In Biddeford, there was a bank and a local business that sponsored the HotSpots. There are lots of possible options to help defray the cost. Axiom would be happy to investigate this option further with you, if this is something that the community is interested in.

We have been amazed at how many users these free connections to the internet have supported- helping community leaders understand how important the internet is to the daily lives of its visitors and local citizens.

High Capacity Corridor

Some communities focus on a particular area to increase economic activity or business attraction. In order to help attract businesses or increase economic activity communities invest in industrial parks or incubator spaces where infrastructure is provided by the community (three-phase power, shared industrial kitchens, workspaces for entrepreneurs, etc.). Increasingly these areas of focus are demanding strong internet leading communities to set up Gig Networks, where users can come and connect to a network that offers very high internet connectivity, typically up to 1000Mbps (1 Gig). These types of networks can be delivered into an industrial park, down a high-density business area or to a building where internet connectivity supports entrepreneurs or other activity that requires significant internet speeds and reliability.

In Whitefield, Route 17, which is heavily traveled and developed, and has fiber, would be an area to explore. Or there may be others. What is important to remember is that the presence of fiber is important and necessary, even more important is to secure and make available low-cost access to that fiber. This is key to any successful project. Exploring this concept in any area of Whitefield would require significant engagement with the Select Board and a list of possible locations should be developed with the pros and cons, which would start with the availability of fiber on or near each proposed site.

One other option would be to connect all municipal buildings to a private fiber loop that is owned by the town. In small communities these include the Town Office, Public Works, Library and Fire Station. There may be others, but depending on the locations of these buildings, a fiber network can be built then offered to businesses or residents along the way for low cost hookups.

Creating a space for disadvantaged citizens to get free or low-cost internet can be achieved through the HotSpots or a location that would allow citizens to come to where fiber would be available, such as a library or the town office. This concept was attempted in the town of Greenbush that was looking to allow citizens to come to a dedicated room at the Town office to access the internet.

Final Thoughts

- Working with Spectrum to build out their service footprint is a sound strategy
    - Investigate current franchise agreement for potential leverage to build out service
    - Look to a potential partnership on a infrastructure grant from ConnectMe Authority in March-April
        - Likely a project between $150,000-$200,000 would be competitive

- LCI is an alternative provider in the area, and may have interest in supporting any of these strategies, they have worked with Axiom to install HotSpots and have high capacity fiber in the region that, if extended could support a high-capacity Gig corridor
    - Work with LCI to identify areas where increased fiber connectivity would be helpful to reach committee and Town goals

- Axiom could provide a full-scale fiber buildout to all homes, but this does not seem like a viable solution
    - A significant amount of subsidy needed- likely in the neighborhood of $1M
    - Difficult to achieve take-rate targets competing against Spectrum service
    - Unclear on position of town officials- but unlikely to fund a large-scale project

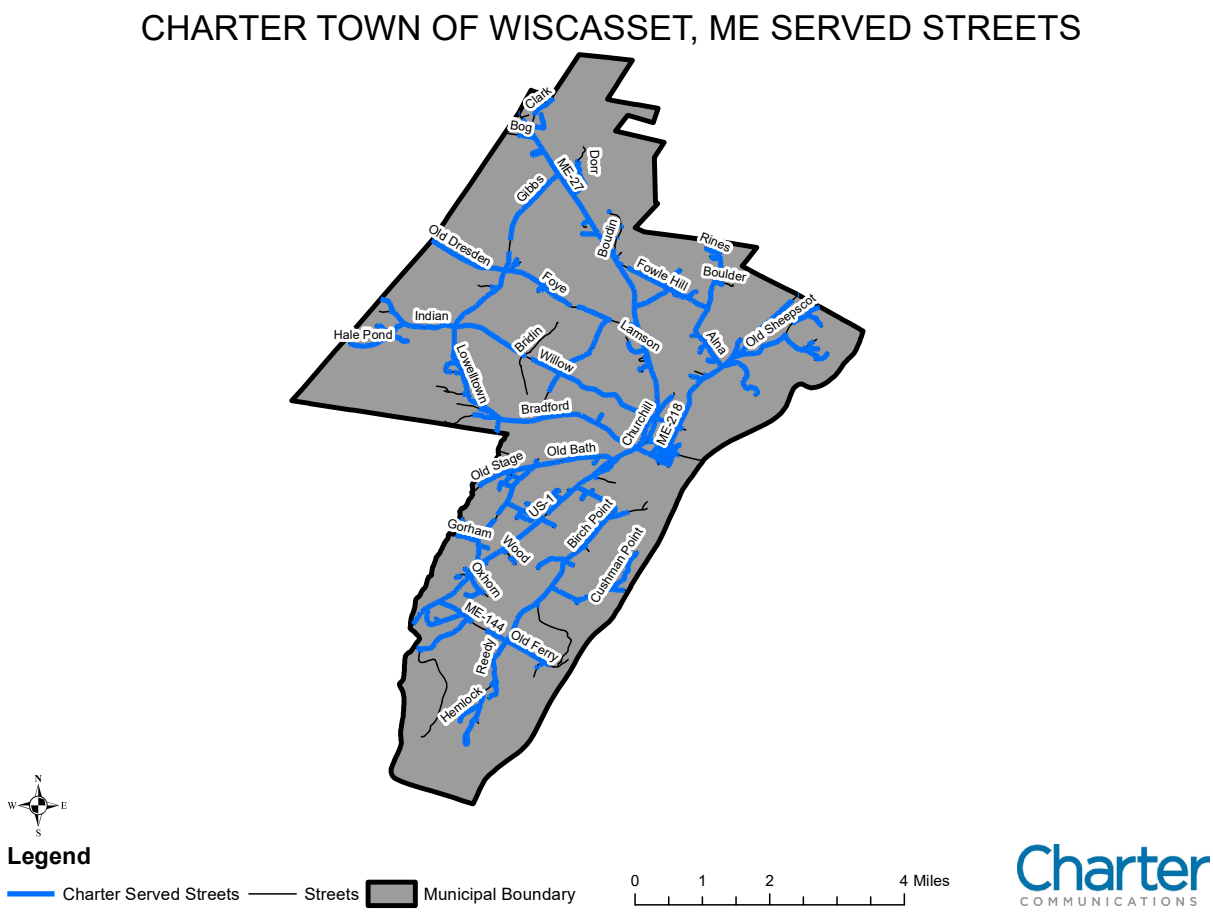
- A partial fiber buildout to areas currently unserved by Spectrum is not viable
    - The minimal number of homes that need better service is not enough to attract another provider

- HotSpots in key areas to act as a stopgap measure for unserved or underserved homes
    - Low-cost, low-risk opportunity
    - Helps support citizens with limited means
    - Can be a building block to highlight need for better connectivity

Wiscasset

Wiscasset citizens have begun to organize a broadband committee and has done some good work with initial involvement of at least one member of the select board. Originally a champion for fiber and a regional approach in this planning grant process, both goals were reaffirmed when a larger broadband committee was formed. This plan includes a full fiber build to every home in Wiscasset. As part of this overall report, a regional plan is also included.

Wiscasset is covered by Spectrum cable/phone/internet service. The map from Spectrum indicates their service coverage area to be virtually ubiquitous across the community.



With this level of service as a backdrop, why would Wiscasset want to build another network on top of Spectrum? There are several good reasons why communities like Wiscasset would be interested.

Own your Own

Any privately-run company, who answers to investors and shareholders, needs to maximize profits. Sometimes, this goal does not align with consumer demands or needs. In Maine, across the many

surveys that Axiom has conducted, Spectrum is considered expensive. There are also complaints about price hikes after low introductory offers, and a number of other issues including variable speeds and reliability. Owning your own infrastructure gives the community more leverage with pricing, customer service expectations, and speed and reliability. Many communities who feel left behind, or want to have a leg up, are investigating publicly owned networks as a way to address these issues.

Better Technology

Installing fiber instantly differentiates Wiscasset from other communities. Fiber optics is the industry choice, offering state-of-the-art connectivity, reliability and speeds. While co-ax cable providers like Spectrum continue to upgrade their systems, the technology has significant limitations that can lead to frustrating user experiences, especially during peak usage times when the system gets bogged down by many users using a "shared line" with limited internet to handle all the traffic. During these times, users who conduct speed test often complain that they are paying for 100Mbps service and yet may be receiving a good deal less, sometimes only 10% of their service contract.

Fiber Benefits

- Best in class speed and reliability
- Handle 21st Century applications and uses
- Futureproof

Fiber offers a number of benefits. Because of its properties (internet delivered over glass vs copper), unlimited speeds are attainable. Current fiber technology that you can buy off the shelf can deliver 10,000Mbps to a home or business. Gig service (1000Mbps) is common, and fiber can also deliver true symmetrical service, where both the upload and downloads are equal. With this type of speed, applications and on-line tools are beginning to utilize the speed and reliability that fiber technology delivers. It will not be long before unimaginable connectivity opportunities like 3-D holographic television will be available- having the right delivery system- fiber- makes these innovations possible. With this type of capability, fiber is virtually futureproof. If you invest in fiber today, it's very likely that demand would not outrun the capability of the service for 40 years or more.

Community Benefits

Small rural communities are struggling with their identity and the challenges of ageing populations, out migration of young families and a struggling downtown and economy. Fiber can make towns cool and connected, helping to revitalize economic development, especially for those that can work from home; increase telemedicine and educational service delivery via fiber; and help attract or retain young families who understand the value of a fiber connection.

Wiscasset's Place in the regional economy and ecosystem

There are many reasons this proposal should be seriously considered by Wiscasset thought leaders. Beyond the benefits listed above, Wiscasset is a regional hub, with 10s of 1000s of vehicles passing through the heart of the city along Route 1 and many amenities that include historical landmarks, exceptional dining, shopping experiences and accommodations for those interested in exploring the area. Wiscasset has done a lot to create an energetic, forward looking community. For a town of its size, it has a lot going for it. Taking the next step would be to consider a significant investment in its people by bringing world class fiber optics to each home and the business corridor. Axiom believes strongly that a

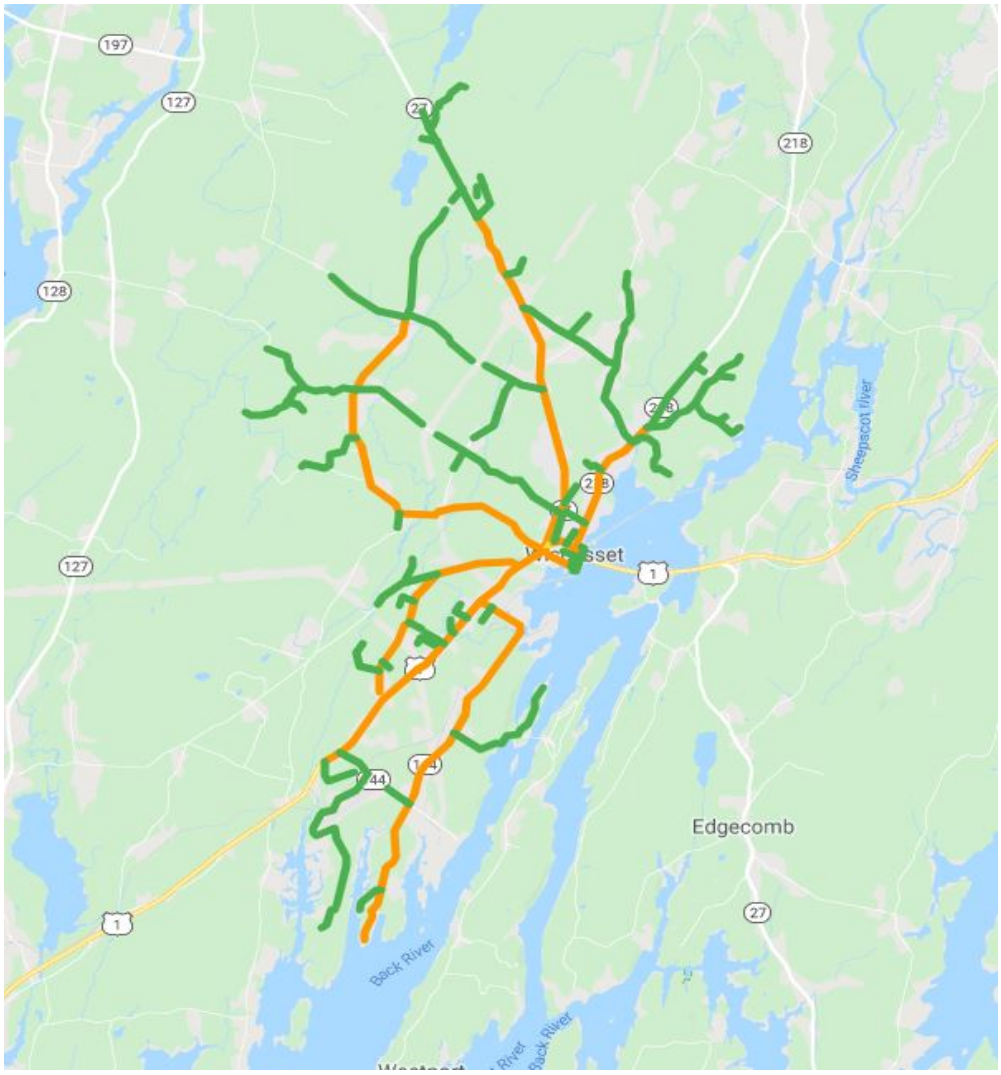
thriving Wiscasset positively affects surrounding communities and creating better connectivity can surely help the town by attracting new families and entrepreneurs, helping the older population remain in their

homes longer, strengthening Wiscasset's role as a regional hub and economic driver while opening up a whole world of communications and entertainment possibilities and the Internet of Things for the citizens who currently call Wiscasset their home.

Fiber Plan

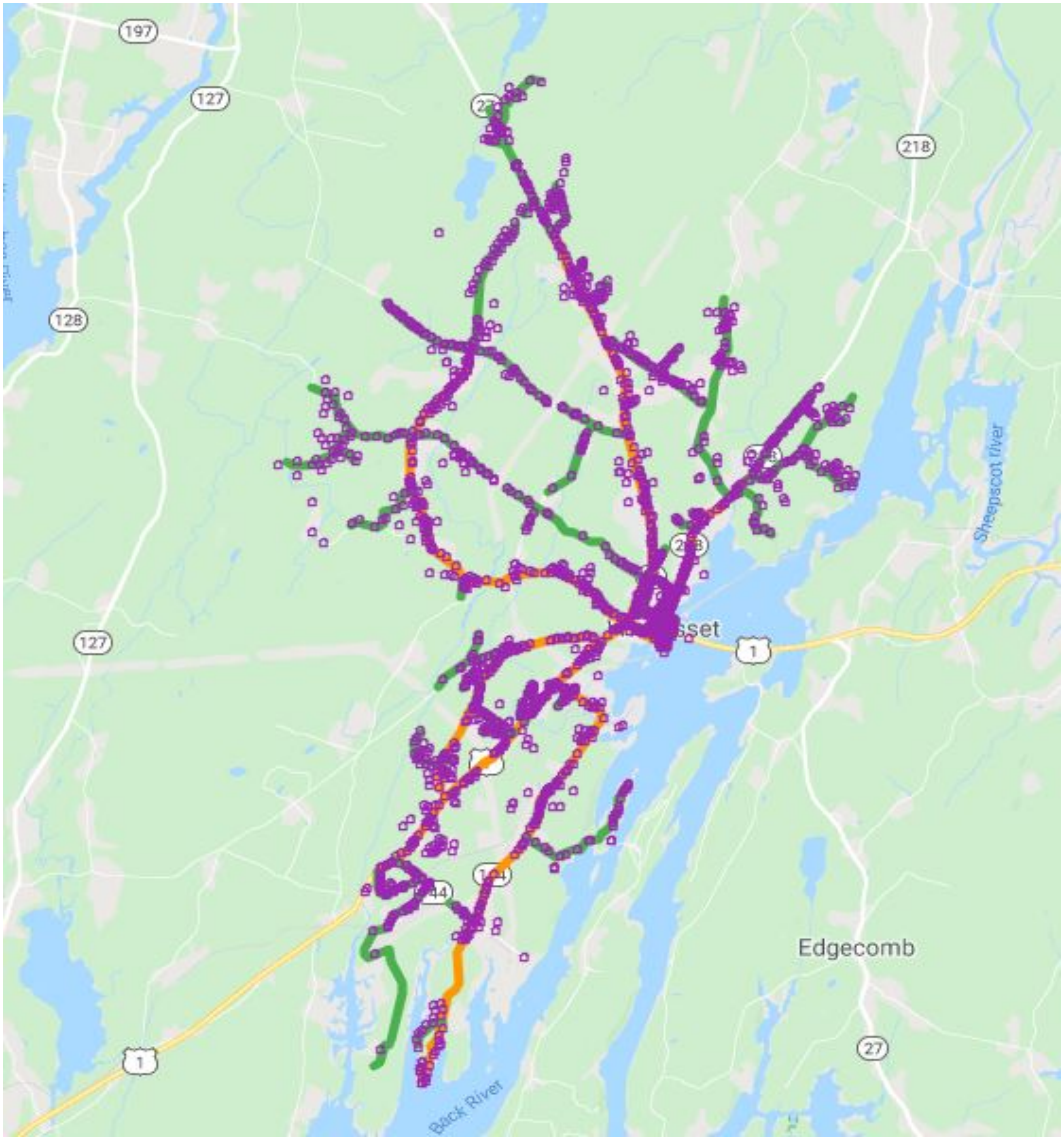
While there are unquestionable benefits of fiber and the community owning any new infrastructure, the cost and upkeep of a system are important considerations for the Broadband Committee and Town Officials to consider.

Wiscasset Fiber Construction Maps



Orange= High Capacity Fiber Trunk Lines
Green= Lower Fiber Count Drop Lines

Fiber Map with locations of homes



Purple circles= locations of homes or businesses

Cost

Category Description		Cost
Materials		$2,606,276
Pole Licensing Application		$80,234
Utility Pole Make Ready	Estimate	$397,575
Utility Pole Replacement	Estimate	$530,100
Regen Hardware		$404,905
Customer Premise Drop Cable	Estimate	$223,960
Customer Premise Installations		$1,527,000
Total		$5,770,051

The total cost of the budget contains several line items that may change and lower the cost of the project overall. A lot of additional costing information will be learned by proceeding with the pole licensing process. For example, we have made some assumptions based on past experience, but the true understanding of the costs associated with pole attachments and make-ready - the cost of other users of the poles moving their lines to "make-ready" a space for a new cable - only will come through the licensing process. In addition, pole replacement costs are estimated and will not be known till the pole make ready work is completed.

This budget contains the hardware for 100% of homes to be connected, however, we calculate a take rate of 40% in year one, which would reduce the up-front cost of customer premise installations by approximately $600,000. Along with other potential reductions, we would expect the cost of construction to be $5M or less.

Breakdown of Cost Components

Materials
The materials line item is the total cost of all the materials and equipment needed to install the system minus the CO/Regen equipment and the Customer Drop Cable, which are located on separate line items.

Pole Licensing Application
This plan requires the placement of fiber optic cabling to be placed on existing utility poles across the community. In order to receive approval, a several step process of several months is required, but begins with the application. The cost of the application is based on the number of utility poles you would like to attach to.

Utility Pole Make-Ready
Make-Ready is the cost of making the poles ready (make-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 the evaluation of each pole will take place during the pole licensing process.

CO/Regen Hardware & Installation

CO refers to Central Office, which is a term of art that Internet Service Providers use to describe where the equipment that would be needed to power the system and where the internet would be distributed from to each home. 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 Cable

This is an estimated cost of the fiber to connect each home from the street to the home.

Customer Premise Installations

These costs are associated with the equipment needed at each home. This is the cost of connection 100% of the homes.

Revenue and Expense Model

As part of Axiom's commitment to our mission to help rural communities more fully understand what ISPs are facing serving a small community, we have created a revenue and operational expense budget that helps the community and the ISP better negotiate an operating agreement through a Public-Private Partnership, should the community choose to own the fiber network.

It's important to understand that these are just an illustration of how Axiom would envision the feasibility of operating a system and what potential customer rates could look like. The potential revenue is based on service levels and take rates that are solely Axiom projections and are intended for illustration only, each provider would have their own revenue and cost models. However, these numbers can show you generally what a provider might expect if the town were to build a new fiber system and importantly, how much capital participation, if any, might be expected from the provider.

Revenue

Year Round

Rate Group	# of Subscribers	Monthly Rate	Annual Revenue
25/5Mbps	508	$69.99	$426,659
50/10Mbps	145	$79.99	$139,182
100/20Mbps	73	$109.99	$96,351
Business Class- 50/50M	5	$109.99	$6,599
TOTALS	725 (40%)		$662,193

Seasonal

Rate Group	# of Subscribers	Annual Rate	Annual Revenue
25/5Mbps	63	$713.99	$44,981
50/10Mbps	18	$815.99	$14,688
100/20Mbps	9	$1121.99	$10,098
TOTALS	90		$69,767
Total Revenue			**$731,960**

- The Rate Groups and monthly cost are entirely Axiom's and may differ depending on provider
- Take-rate is the estimated number of homes we believe would take service. In Wiscasset's case we believe a 40% take-rate is achievable- in year one, with a steady rise as people in town convert slowly from Spectrum and Consolidated

Expenses

Yearly Operating Expenses			Yearly Cost
Bandwidth			$111,456
Phone Technical support			$10,641
Administrative support			$5,608
FC support (local)			$37,868
FC support (Remote)			$144,212
	TOTAL		**$309,785**

Bandwidth is the cost of bulk wholesale internet.
Phone tech support is the estimated cost to maintain phone support for customers for the year.
Administrative Support is the cost of billing/collections and support for billing questions.
Local Field Crew is the cost of Axiom hiring a local person to conduct simple trouble shooting at the home. Field Crew (Remote) is the cost of dispatching Field Crew from Machias to deal with more serious issues- breakage, splicing, etc.

Three important takeaways of this section:

- ◊ How critical take-rate is to the overall viability of the project (less subscribers, less opportunity for profits)- In the case of Wiscasset, the number of homes would be attractive to a provider
- ◊ The monthly operating expenses are generally fixed, no matter the number of subscribers (there is not a direct correlation between subscriber counts and expenses)
- ◊ The yearly profits meet industry standards (50% plus)

Final Thoughts

There are three options for Wiscasset to consider- all are dependent on strong support from the select board, because all choices will require the participation (as a champion and as a financial supporter) to varying levels depending on the path forward.

- Working with Spectrum
    - Spectrum maps can be notoriously inaccurate, so there may be a few small pockets that need to be filled in, Spectrum may help with these areas
    - Investigate your franchise agreement with Spectrum to ensure you are maximizing the value of that contract
        - Leverage the contract to bring Spectrum to the table
- Installing new Fiber optic system
    - State-of-the-art system that will last for at least 30 years or very likely much longer
    - Gives Wiscasset a competitive advantage
        - Attract new families
        - Build home-based businesses
        - Telehealth and educational opportunities
        - Options for cutting cord and cost savings on communications bill
- Work with an alternative provider
    - With LCI having fiber in or near Wiscasset, working with LCI would be a good first step
        - Mindful that LCI model typically has them owning their own fiber
        - LCI is typically willing to participate with capital, in the right circumstance

Grant Funding

One of the community members asked a good question: What can communities do now to get ready and anticipate grant opportunities- and what are the grant opportunities available? This section articulates several areas of focus that communities can work on now, so they are ready when grant opportunities are available. In addition, we have compiled a list of the grant opportunities we are aware of, this list should help your communities investigate potential sources of funding.

Being Ready

Funding

Because most rural communities are governed through a town meeting, typically a warrant needs to be developed and approved several months ahead of the actual meeting. For these communities, we suggest that you begin exploring the possibility of getting something on the warrant.

For those communities that have a Town Council, the funding timeline may be different, but just as importantly all Broadband Committees should educate themselves on the process at council or town meetings. Often, funding opportunities don't line up with town processes and opportunities can be missed simply because of timing.

We recommend having a community set aside a small amount of money; $5000-$20,000 have been amounts that other towns have earmarked that can be used on activities to create grant applications, install HotSpots or used as a match for a future grant opportunity. In other cases, it was just as important to get language endorsing the work of the Broadband Committee and authorizing the Committee to explore any and all funding sources or to regularly report back on findings to town officials as to progress. All positive steps that can move the process forward.

Plans

Many of the communities have Spectrum recommendations to expand their service. For those communities, engaging Spectrum officials now to start a conversation will hopefully avoid the unfortunate situation that Westport found itself in when they received the information they needed to support an application to the ConnectME Authority a day before the application was due and they missed the deadline. Starting early engagement with any possible Internet Service Provider is very important. Building trust, agreeing to common goals and roles and responsibilities will go a long way when opportunities arise to work together.

Goals

After looking at your town plan, you should consider and settle on your goals. "My internet stinks" is not a goal. Typically, communities that do well are able to articulate the answer to this fundamental question: Why? Why should the town focus on this? Why should we spend taxpayer dollars? Why is this important? The Broadband Committees in each of your communities must settle on their goals and be able to articulate those goals not only to their town leaders but to other citizens to build support. It is important to find a champion- someone who I like to call EF Hutton- when they speak, people listen. This could be a town elected official, but many times it's someone else who has significant influence in the community. This person can be critical to the success of any project. Start now and create a narrative for when you appear before the Select Board or Council and find a champion if you don't have one yet.

Explore the Criteria of Funding Opportunities

The Committees should look at each of the potential funding sources listed below to see if the criteria can be met by the community. Whether it's a cash match, or will only serve areas with minimal speeds, or a host of other eligibility requirements, many small communities are not used to the level of intensity required to successfully apply for a grant. Be prepared. Know what the requirements are and start to assemble the needed documentation to give your community the best chance.

Advisory resources: Beyond Axiom, Peggy Schaffer, the Director of the ConnectME Authority can be a good resource for communities. She is one person- be mindful of that- and can be reached at Peggy.Schaffer@maine.gov.

Grant Opportunities

The ConnectME Authority offers two types of grants- Infrastructure and Community Broadband Planning Grants. For the purposes of this report, the planning grant is not a consideration. We would recommend looking toward an Infrastructure grant, details can be found here: http://maine.gov/connectme/grants/

Axiom has extensive knowledge of these grants and have received many of these grants totaling over $1M.

- Grant proposals must meet the state standard of 10/10Mbps
- Grant limits are suggested, but typically $100,000, which must be matched 1 to 1 with a combination of cash and in-kind services
- Area targeted must be unserved or underserved (Service that is less than 25/3Mbps)

Typically grant is open for applications in the March- April timeframe, but is not clear this year when grants may be available.

The Maine Community Foundation has regional grants that can support initiatives up to $10,000 a year found here: http://www.mainecf.org/GrantsNonprofits/AvailableGrantsDeadlines/CommunityBuildingGrantProgram.aspx

- Grants available up to $10,000
- Local decision makers by county
- Various criteria that needs review
- Deadline February 15th of each new year

The Foundation also has grants up to $15,000 for Community Broadband related activities, the deadline just passed but details of requirements can be found here: https://www.mainecf.org/apply-for-a-grant/available-grants-deadlines/community-broadband-grant-program/

- Grant Awards up to $15,000
- Typically, 10 awards yearly
- Application deadline October 15th

Northern Boarder Regional Commission Grants located here: http://www.nbrc.gov/
The Commission accepts grant applications from across the northern border regions of Maine, New Hampshire, Vermont and New York.

- Requires at least a 1 to 1 cash match
- Must be tied to quantifiable job creation
- Very competitive

Contact: Andrea Smith at (207) 624-9813 or andrea.smith@maine.gov for information on deadlines and program parameters.

Grant Funding Resources- Federal

U.S. Department of Agriculture (USDA) has several potential programs that would fund Broadband expansion opportunities. The most important of these is the **Reconnect Program** which is getting ready to announce next year's program (they are announcing winners from this year now). Details of the program can be found here: https://www.usda.gov/reconnect/program-overview

We expect a program of $550M available to be divided in three categories- 100% grant, 50/50 grant-loans and 100% loans. Each of these categories have slightly different criteria. This year Axiom was a significant contributor to two 100% grant applications and one 50/50 application. To date, two have been awarded and we are awaiting word on the third.

- Extremely difficult to apply for with lots of different document and eligibility requirements
- Most importantly, no home being served can have the capability of getting service of 10/1Mbps or higher
    - This requirement is slightly different for the 50/50 grant where up to 10% of the proposed service area can have service above 10/1Mbps
- Even in the 100% grant, the municipality or applicant is required to have a 25% cash match

After looking through the program overview and other details, please contact Mark Ouellette, the author of this report, as he is familiar with this opportunity and can try to answer questions- mark@connectwithaxiom.com. Also available is the USDA Maine State staff, which can be contacted at 207-990-9100

USDA-RUS Programs offer a number of other potential opportunities to investigate located here: https://www.rd.usda.gov/programs-services/all-programs/telecom-programs. By far the easiest is the Distance Learning and Telemedicine Grants.

U.S. Department of Commerce- **Economic Development Administration (EDA)** provides funding for economic development projects across the state of Maine. Maine projects are reviewed and administered by EDA's local representative, Alan Brigham at (215) 316-2965 or abrigham@eda.gov. Programs and eligibility can be found at www.eda.gov

- Various funding programs
- Guidelines encourage regions to incorporate BB investments in their regional strategies (CEDS)
- Funding requires match

U.S. Department of Commerce- **Broadband USA** is helping communities nationwide ensure they have the broadband infrastructure, digitally literate workforce and engaged citizens to thrive in the Digital Economy.

Details can be found here: https://www2.ntia.doc.gov/

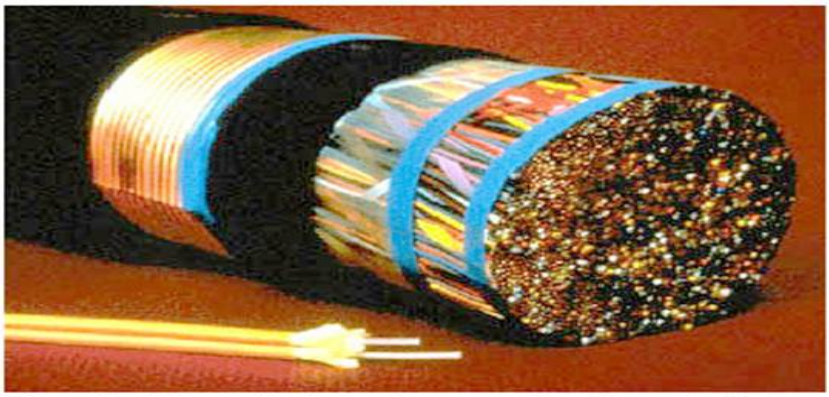
- Provides direct (one-to-one) assistance to communities
- Resource rich website- no direct grants
- Building a self-assessment tool for communities

Vision

Communities across Lincoln County are looking for solutions to help enhance their way of life. But in the digital age we live in- healthcare, education, job growth… even shopping and entertainment are impacted by the type of broadband available to the citizens who live, work and play in each and every one of your communities. At the end of the day, people just expect it to work, they don't care about the technology (DSL, Cable, Wireless or Fiber) what they do care about is if the connection does what they need to it to do for their business, education or entertainment. That's the true test… is your current connection doing what you want it to do.

We believe that all of you reading this report have an opportunity to change the economic status of your towns. Investing in regional and individual community projects that will bring business prosperity, bridge the digital divide and give individual citizens the tools they need to create their own economy- all through better internet connections.

Right now, the majority of your connections in the region are either DSL or Cable, and both run on essentially the same technology. Additionally, Fixed Wireless has been utilized to connect remote customers, as a cost saving technology, where other technologies do not make sense. All have limitations that make them less than ideal, although all three technologies are making some strides in addressing the needs of their customers. An emerging tool that is beginning to be utilized to replace these less than optimal technologies is Fiber Optics to the home as a last-mile connection solution.



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

Fiber optics is the most expensive technology to deploy but is an investment that will last 20 years or much more and is the least expensive option over time. While expanding or enhancing current technologies may make sense today, rapid changes in how the internet is being used is driving decision making toward a more permanent solution- Fiber.

Job Creation- Much of the region is micro-or home-based businesses and the lack of better connectivity is hurting their prospects to grow. Right now, the location of your home or small business dictates the reliability, speed and cost of your connection. To support job creation, one tool would be to bring high-speed internet, and address the economic lag that is created by lack of connectivity.

Business Attraction- Communities across Maine look to bring new businesses to their community helping to rebuild Main Street and bring vibrancy to their downtowns. However, in rural communities the challenge is to differentiate themselves from other, equally attractive places. We often hear that a business will not move to a location with a poor internet connection.

Entrepreneurship- Because Maine is one of the oldest states in the United States, we often struggle with keeping our young people or attracting new families to our communities- world class connectivity allows families, who can increasingly work from anywhere, move to Maine, for our way of life while still maintaining a job elsewhere- all because of a robust internet connection.

Telemedicine- We have already mentioned that we are an ageing state, and that will require better solutions for our seniors who wish to stay in their homes longer and are increasingly able to receive care through tools that are fully enabled by an internet connection.

Education- Lifelong learners and our kids are increasingly being left behind by not being able to research, do homework or educational work online, because of the lack of connectivity, commonly called the Digital Divide, where more rural citizens do not have the same access as urban areas in Maine and around the country.

Technology Pros and Cons

Technology	Pros	Cons	Cost
DSL- Consolidated Communications	▪ Already covering most of county ▪ Can reach low density areas effectively, but requires equipment upgrades	▪ Old Technology ▪ Copper is susceptible to corrosion ▪ Distance the signal can push is limited (3 miles) ▪ Very limited bandwidth (less than 25Mbps) ▪ Not symmetrical	$70,000 per new Remote Terminal
Cable- Spectrum	▪ Recent upgrades are able to achieve over a 100Mbps ▪ Provider is open to expansion ▪ Reliable ▪ Can bundle, phone data and TV	▪ Not as scalable, expensive to upgrade ▪ Not truly symmetrical- limited on how bandwidth can be pushed in both directions ▪ Shared system, demand on system effects user experience ▪ Expensive to consumer	Case by Case
Fixed Wireless- Red Zone	▪ Reach areas not covered by current providers ▪ Lower cost solution ▪ Line of Sight best application for Wireless	▪ Can be affected by weather ▪ Less reliable than fiber ▪ No guarantee that all homes can be served in an area ▪ Terrain and other factors affect the signal	$100,000- $150,000 per 100 connections
Fiber- LCI	▪ Current technology allows for up to 1Gig (1000Mbps) of service to each home ▪ Easily and inexpensively scalable ▪ Top reliability among all technologies ▪ Futureproof- 20 years or much longer	▪ Up-front costs are much more expensive ▪ Financial model is more difficult to achieve in very rural applications ▪ Often requires subsidy of outside (taxpayer) dollars to deploy	$25,000 per mile, $800-$1000 per connection to the home

	▪ Symmetrical- built for the future ▪ Can deliver data, phone and streaming TV content		

The tradeoffs boil down to cost versus capability. If the region wants to transform itself and build a 21st Century economy and leapfrog almost all of Maine, we think fiber is the technology to consider. It helps you reach all of your goals, makes the region even more attractive than it is already and will support future demand with little to no upgrades.