JEFFERSON COUNTY PUBLIC UTILITY DISTRICT

Broadband Infrastructure Expansion Plan

Magellan ADVISORS

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FINAL

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Executive Summary

INTRODUCTION

Robust broadband has become a necessity in the 21st century. Broadband is now treated as another essential utility on par with water, sewer and power, enabling us to live healthy productive lives. However, adequate broadband is still limited in many areas of the US, particularly in rural regions where for-profit companies have found it difficult to deliver and maintain in an economically viable offering. This results in many rural residents and businesses lacking access to adequate or affordable broadband options, putting them at an economic and opportunistic disadvantage.

Jefferson Public Utility District (JPUD) acknowledges that the communities it serves lack robust broadband and have commissioned this Plan to explore addressing this unmet need. Like other utility providers across the nation, Jefferson PUD is asking how they can help and what role they could play in this effort to increase broadband in the region. This Plan will identify JPUD's potential role in the delivery of modern broadband services throughout Jefferson County and their service territory.

After a competitive RFP process, JPUD retained the services of Magellan Advisors to help them identify which options are most appropriate for them to consider for delivering or facilitating broadband throughout their service territory. A range of potential business models is in use today by various similar entities, and JPUD has many approaches to consider. This report will outline which options are best suited for JPUD and the community by weighing the possibilities to choose the right path for both JPUD and the community it serves.

To understand the issue of broadband in JPUD's service area in depth, Magellan worked in conjunction with JPUD to find out the status of broadband in the region, analyze available options/models, and make a recommendation about how to proceed.

Magellan worked with JPUD to develop a customized online survey for both businesses and residents to provide feedback and sentiment regarding broadband, including its availability, affordability, usage patterns, and future needs, as well as the adverse effects of not having broadband available to the community. The results of that survey are included in this report. Magellan also had interviews with both internal (JPUD employees and Commissioners) and external (municipalities, schools, ports, hospitals, Citizen Advisory Board and others) stakeholders to understand their concerns and requirements surrounding broadband.

To get a better understanding of how some other utility providers are addressing broadband issues, Magellan also spent time with several neighboring utility providers with an interest in applying some of their best practices into JPUD's model

recommendations. Lastly, Magellan brought many years of experience of assisting other organizations with similar concerns and challenges into the final recommendations.

FINDINGS

The online survey produced more than 1,200 residential responses, indicating that many residents are concerned with the state of broadband in the region. Results from both the residential and business communities show that many areas of the JPUD service territory lack robust broadband as defined by the FCC (25 megabits upload and 3 megabits download).

The online survey indicates 45.1% of 1,229 residential respondents have either no internet or only have access to slow speeds and outdated infrastructure such as DSL. A lack of availability was by far the most identified reason for not having broadband; compared with factors such as price and speeds, nearly 65% of respondents who don't have internet access ranked "broadband is not available" as the most important reason for not having it.

With 95% of residential respondents indicating that internet service is either critical or very important to them, the lack of broadband throughout JPUD's service area poses major challenges to the community.

Among the survey's 44 business responses, only 59.1% indicated that they had high-speed broadband, and 98% stated that internet was very important or critical to their businesses.

Full detailed survey results as well as findings from other outreach can be found in **Chapter 4: Needs Assessment**.

MODEL RECOMMENDATION

In order to fill those gaps, this Plan evaluates several business models that would enable JPUD to deliver affordable, robust broadband to the community by capitalizing on its existing assets while reducing financial risks.

Magellan is recommending a hybrid model that includes elements of a Mason PUD 3 and Kitsap PUD approach by developing "fiberhoods" as targets for potential broadband solutions, implementing fixed wireless solutions for areas where fiber deployment is not cost effective, and seeking a partnership with a wireless telecommunications provider to deliver broadband through a competitive RFP process. We have combined these approaches because fiber deployment alone can be expensive and has a long-term return on investment. More affordable wireless solutions and partnerships will enable the utility to build broadband infrastructure with partners that can also be purposed for the expansion of the fiberhood model over

time. This approach has the potential of attracting new investors and partners who will use the infrastructure for delivering expanded fiber and wireless services.

This approach reduces the risk for JPUD and primes the pump for others to not only invest, but to share in the marketing, management and operations of the fiber and wireless networks.

Fiber and Fixed Wireless Partnership Model

Magellan also evaluated the potential business related to a partnership with a wireless provider. This hybrid model could deliver cost effective fiber, fixed wireless and county wide wireless as the technical solutions for delivering affordable broadband to the rural communities of Jefferson County.

Best Practices

The PUD should continue to work closely with current providers such as CenturyLink, Wave and other entities interested in expanding their fiber assets throughout the region. The PUD has entered into joint builds with these carriers to help both companies augment the cost of building fiber. As the PUD looks forward, they should welcome any opportunity to work with providers wanting to expand their networks.

In addition, as the PUD looks to expand its own network bringing it closer to the end users, they should look for grants, joint builds, like-kind exchanges and other practices to reduce overall costs.

Key Features of the Each Model

Wireless Provider Partnership The Plan uses a wireless partnership model that could be developed with any wireless service provider in the area. Any such approach would likely need to be vetted through an RFP process and other interested entities may be identified at that time.

This approach represents a model loosely like one used and implemented by Orca's Power and Light Company (OPALCO), a neighboring cooperative utility provider servicing the San Juan Islands. OPALCO uses a model by which it partners with one of the largest wireless providers in the nation, T-Mobile, which has implemented a program to help deliver broadband to rural communities throughout the US. T-Mobile partners with interested utility providers in the design, deployment, and management of a broadband network, creating a win-win position for both organizations and for the community. While T-Mobile is predominantly known as a cellular provider, they are also experts in fiber, fixed wireless, and 5G solutions. Partnering with such an entity could combine their experience in broadband design, build, management, spectrum assets, and sales with JPUD's network assets such as sites, towers, poles, existing fiber, local presence, and financial resources. These combined efforts could facilitate

wireless service that will cover currently underserved areas at reasonable costs with relatively fast times to deployment.

Revenue is shared based on each company's portion of capital and resources contributed. As fixed wireless will be a cost-effective last-mile solution for some regions, especially when compared with fiber, a wireless partner could also bring valuable spectrum resources not otherwise available to JPUD. Financial risks are shared between the two parties. The wireless carrier partnership model is aimed at providing a solution that covers the entirety of Jefferson PUD's service territory.

Hybrid LUD/Fiberhood. Mason 3 and Kitsap PUD both deliver fiber-based broadband to select communities within their respective service territories. There are some nuanced differences between how each company facilitates their model, but both follow practices that are common among utility providers. Each of these companies focus broadband efforts on areas where they currently have or are planning to build SCADA-supporting fiber and extend that fiber into "fiberhoods". Excess fiber capacity from the SCADA network is made available to select communities for broadband internet access. Each company targets unserved or underserved neighborhoods and, if residents collectively agree to help cover the last mile infrastructure costs, the utility company will provide them with up to 1Gbps broadband made available through participating internet service providers (ISPs).

Once a community has expressed interest, the PUD designs and costs a solution and presents the community their last mile cost obligations. If enough agree (80% for Mason 3), the utility company will put that community on the schedule for construction.

Mason and Kitsap differ in how they finance the last mile for each of these fiberhoods. Mason 3 self-finances and charges a $25 per month fee for 12 years to cover these costs, whereas Kitsap creates a Local Utility District (LUD), which then qualifies the end user for a loan from a local credit union to be paid off over time. Mason's model uses a construction account established by its Commissioners that is a replenished as subscribers pay down their construction costs.

Neither Mason 3 nor Kitsap use fixed wireless for their last mile technology. However, Magellan recommends that JPUD consider implementing fixed wireless for communities where fiber may be cost prohibitive in the short term so they are not excluded from the broadband program. Over time, with the construction of fiberhoods and infrastructure for a countywide wireless solution, connecting these communities with fiber will prove more cost effective.

This particular model will also allow JPUD to continue to focus on residential, business and anchor institutions for revenue and network management, design, logistics and ISP support are all done internally. NoaNet helps with network management after hours.

General Comparisons of Approaches in the Hybrid Model

To summarize, below are some key points about approaches in the hybrid model for comparison.

Fiber and Fixed Wireless Partnership:

- Covers entire service area
- Uses a combination of fiber, fixed wireless, and 5G to deliver last mile
- Acts as the network administrator
- Brings valuable spectrum resources and wireless experience to the project
- Has matching funds to contribute to the partnership
- Will allow for an Open Access Network paradigm
- Is a higher risk/higher reward model when compared to the alternative
- Brings expertise in network building/management that JPUD does not have today

Hybrid LUD/Fiberhood

- Builds are targeted at fiberhoods and communities to be served with fixed wireless where current service is underperforming or where opportunity presents itself
- JPUD model will incorporate fiber and fixed wireless (when spectrum is available and appropriate)
- Will not provide blanket coverage of service territory
- Is lower risk/reward than other models (users commit in advance of any building)
- Financial risk is limited due to these commitment requirements
- LUD and associated financing models have worked in other communities, however, it is unclear whether communities in JPUD's service territory have the appetite for LUD borrowing
- JPUD model could target competitive or served areas with an alternative to existing providers, but JPUD will have to measure its risk tolerance

Both Approaches:

- Capitalize on excess capacity of existing fiber and other JPUD assets
- Can take advantage of potential state and federal grants to help offset network costs
- Target unserved and underserved communities
- Use an Open Access Network model paradigm

- Will build opportunistically and incrementally

More details on each approach and other examples explored can be found in **Chapter 5: Business Case Analysis**.

NETWORK COSTS

A key concern for JPUD is limiting risk to the existing utility company's financial position. Some electric utilities considering options for delivering broadband have experienced pushback from a few members of the community concerned that their utilities rates will rise to help offset the broadband business. It is an issue that should be addressed with care.

The business models proposed in this Plan do not require an increase in existing utility rates to help pay for broadband. The intention is for the broadband business to be self-sustaining and to pay for its expenses through revenue generated. However, there may be a period during the first few startup years where the electric company may have to provide resources to get the business running. There is always a lag between the time construction and planning starts and the time when revenue can be realized. This constitutes part of the JPUD risk assessment profile.

PROFITABILITY

There are many different ways to interpret profitability including net income, EBITDA, cash flow, and ratios required. Generally, profitability comes down to two important items: initial investment and cash flow.

Several inputs are used in financial modeling, including subscriber take-rate (number of customers who will sign up for service). The more subscribers, the better; the network has fixed costs regardless of whether it has one user or 1000 users, but having more users means recovering those fixed costs quicker.

Take rate assumptions are based on competitors' rates in comparison to this Plan's proposed offerings and price sensitivities of the communities in areas where JPUD might go head-to-head with an existing provider. The wireless carrier partnership approach will use this model.

The fiberhood model eliminates the risk of low take rates since nothing is built until commitments are made. The risk for the Hybrid LUD/Fiberhood model is predicting how many users will agree to the LUD financing model. This model will take time to establish and get commitments and, in the meantime, the PUD still has to pay staff, advertise and prepare themselves to support the model.

This model also assumes network management is outsourced, rather than done internally. The outsourced vendor could be selected via an RFP process. We would

expect NoaNet to participate. Expectations for roles and responsibilities is laid out in this Plan.

For the Hybrid LUD/Fiberhood model, and based on our assumptions, which are detailed in **Chapter 7: Financial Analysis**, we anticipate JPUD to need a net of $1.1M of upfront investment over a five-year period before becoming cashflow neutral, assuming 1500 subscribers. With1500 subscribers, JPUD will never become cash flow positive because funds will not be available to pay off the initial investment. However, with 2000 subscribers the repayment of the $1.1M investment is eight years, with positive cashflow in subsequent years. More users mean a better ROI.

Figure A. Financial Summary for Hybrid LUD/Fiberhood Model

$1.1 Million Upfront Investment	**1500 Subscribers**	**Cash Flow *Neutral* In 5 Years**
	2000 Subscribers	**Cash Flow *Positive* In 8 Years**

Investment Resources Required – Hybrid LUD/Fiberhood

For JPUD to replicate the Hybrid LUD/Fiberhood, the following investment resources would be required:

- Capital Expenses
  - Upgrades to existing network
  - Equipment to support Lit Services model
  - Facilities Upgrades (rack space, security, utilities)
- Operating Expenses
  - Internet Access
  - Staffing
    - Broadband Manager, Administrative, LUD Facilitator, Marketing, ISP Collaboration, Engineering
  - Miscellaneous overhead such as power, web support, commissions, network management software/licenses, legal
  - Capital fiber leases from existing providers to augment current network design and provide redundancy

Capital Expenses

The network fiber infrastructure that comprises the existing backbone is paid for or offset by the electric utility. However, any new backbone or buildout not aligned with the internal needs of the electric utility will be the responsibility of the broadband program. In the short term, the PUD should capitalize on existing fiber assets useable

for the broadband program and refrain from building new backbone until grants or other joint build arrangements can be employed for broadband.

To support a lit services model, the PUD will need to upgrade their current network hardware (electronics) to support redundancy. This hardware is anticipated to be about $1,200,000 and includes:

- Core Switch Routers
- Optical Line Terminals (OLT's)
- Switches and Servers
- Racks/Cabinets
- Network Management Software

Facilities Upgrades include:

- Security
- Co-location entry systems
- Cabinets/Racks

Some potential partnership opportunities may include a sharing of network resources, thus eliminating the need for separate hardware costs.

Operating Expenses

Operating expenses are generally calculated as monthly reoccurring expenses and not capital improvements.

- *Staffing.* Roles and responsibilities are outlined in this report, but a summary of required staffing to support a broadband offering include:
  - Broadband Manager
  - LUD Facilitator – Sales and Marketing – ISP Collaboration
  - Engineering and design
  - Administrative support
  - Total anticipated annual staffing expense: $450,000
- *Internet Access.* The PUD will aggregate all local traffic and hand it off at a point-of-presence (POP) - $15,000 monthly
- *Misc. Expenses.* $5,000 – Marketing, office space, utilities, software licensing
- *ISP Management Expense*. ~$10 per month per subscriber

Total annual operating expenses come to $690,000 or $57,500 a month plus network management expenses. Staffing could be reduced by sharing resources with the electric utility, but as more users sign up for service over time, the staffing requirements may change.

Revenue Assumptions

The buckets of revenue that the PUD should pursue include:

- Anchor institutions
- County/state or other government facilities
- Dark fiber
- Co-location offerings
- Conduit Leases
- Tower Asset Lease
- Residential and business offerings

Fiberhood Revenue

Fiberhood end user pricing for 1Gbps/1Gbps best effort includes:

- $65 monthly recurring cost (MRC) not including last mile financing for new fiber
- $40 to the PUD
- $25 to the ISP
- $25-$35 for new fiber
- $90-$100 MRC Total for 1Gbps/1Gbps service

End user target pricing is based on comparable services and offerings throughout the region and US broadband rates in general. Many carriers across the nation offer a 1Gbps service MRC of about $79-$99, while others offer even higher prices. Magellan believes that JPUD's market could support a $90 to $100 target price, typically at $90.

Net to the PUD

The net MRC to the PUD is $30 per month per subscriber if the PUD pays an overhead expense of $10 per subscriber for network management. This $10 MRC will have to be negotiated via an RFP process, or it could be negotiated to a flat monthly network management fee.

If fiberhoods are 80% of the PUD revenue from broadband while the other "buckets" make up the remaining 20%, the PUD would need to get 1,533 subscribers before breaking even and covering all expenses ($57,500 X 80% / $30 net = 1,533 residential subscribers). This does not take into consideration monthly depreciation expenses for the network infrastructure hardware as listed above.

Ramp Schedule

We anticipate a four-year ramp to the full 1,500 residential subscribers which gets the PUD to a breakeven position. This ramp provides time to develop the program, identify potential fiberhoods, get commitments from the end users, and then build the fiberhood network. Assuming a fairly even ramp schedule, this would mean roughly 375 new subscribers per year for the four years.

Figure B. Revenue from Fiberhoods Over 5 Years

Year	Number of Subscribers	Revenue

Year 1	32 new subscribers per month	**$73,164**
Year 2	Even Ramp	**$208,236**
Year 3	Even Ramp	**$343,308**
Year 4	Even Ramp	**$478,380**
Year 5	Maintain current subscribers with no additional subscribers	1,500 subscribers x $30 x 12 = **$540,288**

Figure C. Comparison of Cashflow and Cumulative Expense by Subscriber Base, Years 1-8

FiberHoods			
	5 Years	**8 Years**	**8 Years**
Total Subscribers	**1500**	**1500**	**2000**
Cumulartive Revenue	$1,654,550	$3,232,896	$4,338,030
Cumulative Expense	$2,312,693	$3,834,798	$3,623,949
Net Revenue	($658,143)	($601,902)	$714,081

For the PUD to be cashflow positive, it would take 8 years and a base of 2,000 subscribers. All subsequent years add $180,000 in net profits. Revenue from other offerings, outside of fiberhoods, would have to net $135,000 per year in revenue to break-even.

The fixed wireless model has the same net revenue expectations but may require an additional $50,000 per site cost not covered by the end user financing model. It also has a less expensive last mile hardware component. The fiber models call for a $1500 per subscriber added to last mile costs, whereas the fixed wireless model would contain a $300 cost of CPE (customer premises equipment) instead. The reason for deploying a fixed wireless solution is to reduce the overall cost when compared to a fiber solution for that same end user. Fixed wireless will be targeted at end users where the length (cost) of deploying fiber would be beyond the typical $1500 target.

Fixed wireless does not necessarily change the revenue and costs to the PUD, but does reduce the potential end user MRC.

Fixed wireless models are included in this Plan based on best assumptions with regards to coverage and speeds based on available unlicensed or semi-licensed spectrum. RF engineering was not within the scope.

Financial Conclusion: Fiberhood Model

The PUD would need to invest roughly $1.1M spread over the first five years. After five years, no more investment is needed to breakeven as revenue will cover expenses. However, 1500 subscribers will not allow the PUD to recapture their investment given that the revenue will only cover existing expenses with no excess cash to repay the investment. A more realistic target should be 2000 subscribers as it will allow for the investment to be recaptured in eight years and then provide a positive cashflow after the initial investment is paid off.

There are other intangible community benefits from having robust broadband that are difficult to capture on a financial model. Placing value on those intangibles is up for interpretation but must not be discounted. Examples include economic development, quality of life, government innovation, smart grid, improved public safety, virtual education and telemedicine.

There are also ways to reduce the operating cost and management costs through the use of grant funds and collaboration of shared resources with neighboring PUD's, including hardware, management, and even staff.

Middle mile and last mile construction costs are supported by the end user and therefore are not included in any cost allocations in the financial representation.

Getting to 2,000 Subscribers

The underlying impetus for this project was to explore JPUD's options for providing broadband service to predominantly unserved or underserved areas of the service territory. While JPUD may choose to only target those defined areas, leaving the current providers to continue to provide service in the more populated areas, Magellan's recommendation is for the PUD to create fiberhoods and fixed wireless solutions for any area that shows interest, even if it is in downtown Port Townsend, which is not generally considered an unserved region. If the end users agree to the terms, it is in their best interest and JPUD's best interests to support them. This Plan includes fiberhood and fixed wireless model information for both typically unserved and served regions.

Financial considerations for the wireless carrier partnership model will be made available once the vendor provides their proposed business plan with associated costs, roles and responsibilities, and capital requirements. This will be shared with JPUD in the next month or two.

PLANNING FOR A SUCCESSFUL BROADBAND SERVICE OFFERING

Delivering broadband to an end consumer is different than delivering other utility services including water, sewer or even power. However, there are also some

similarities that make entering the broadband service business paradigm approachable for utilities. Jefferson PUD should consider the following recommendations for entering the new business venture of delivering broadband:

1. **Understand your market and end user requirements**. Each market's broadband requirements are different. Some communities have robust residential opportunities but lack strong commercial or business customers, while others may be just the opposite. Jefferson County has a need for more robust broadband in both the residential and commercial markets. The speeds and services they require will dictate the network design, requirements and costs. The communities' price sensitivities also influence the network services offered and the ultimate return-on-investment.
2. **Be forward looking**. Building and delivering an appropriate broadband solution will require a long-term commitment and strategy supported by the community, management, and the Board. Building networks can take several years. Look to deploy technologies that will be long-lasting and easily upgradeable as user requirements and expectations change over time. What is acceptable today may not be in the later years of the build. Plan accordingly.
3. **Vest the community in the solution**. Given that Jefferson PUD is not a for-profit company, it will need to work closely with the community to help them understand that they are part of the solution. They need to commit to subscribe, finance some last-mile infrastructure, and champion the offering to others in the community. JPUD will need to establish some ongoing outreach programs and efforts to help the community understand their role in the success of the project.
4. **Capitalize on the strengths of the electric company.** The electric utility has assets in place and is planning new assets that should be used to help augment the cost of delivering broadband. JPUD has facilities, fiber, towers and vertical assets, power, and financial resources that can be used to greatly reduce the cost of a typical deployment. Initial broadband services should be targeted at locations where fiber and other assets already exist. As the electric utility looks to expand and upgrade its network, it should do so with broadband considerations taken into account.
5. **Broadband planning and thinking should permeate the organization**. Delivering and supporting broadband is not for the casual management team. Leadership must support and drive broadband efforts through all levels of the organization including planning, engineering, construction, finance, customer support, ISP outreach, marketing, and staffing. The culture of the existing organization will change and managing that change will be a key to the success of broadband efforts. Everyone should know their role

and expectations for supporting the effort and its benefit to the company and the community.

6. **Learn from others**. There are plenty of experienced utility providers delivering broadband to end users. Some have very different approaches, while others seem to follow some relatively similar business practices. Each utility provider understands their own strengths and weaknesses as well as the needs and challenges of delivering a solution to meet those needs. Capitalize on the experience of others and tailor it to JPUD's circumstances. Collaborate with others as much as possible including other local PUD's and cooperatives, the community, and other government organizations with interest in delivering broadband.

CREATING A BROADBAND COMPANY

Below are the next steps JPUD should take toward addressing the broadband issues in its community:

1. **Commissioners ratify this Broadband Feasibility Study When Completed.** Commissioners' ratification provides staff with approval to implement these recommendations and move forward with this Plan. This ratification would also include supporting the costs/resources associated with the next implementation steps.
2. **Assign staff and resources.** Resources should be assigned with specific responsibilities to drive these recommendations. Staff should consider hiring a full-time broadband manager focused specifically on the creation of a Detailed Business Plan. This report details the attributes and skill sets required of a broadband manager and can be referenced when searching for an appropriate person. Magellan can provide detailed job specifications and salaries and wages upon request.
3. **Create a Detailed Business Plan**. This Infrastructure Expansion Plan provides guidance, direction, and recommendations on how JPUD can deliver broadband to the community through capitalizing on their assets, organizational structure, and position within the region. A formal Business Plan covering detailed items such as exact end user pricing and service offerings, marketing and sales strategies, prioritized target markets, financing and accounting, and staffing assignments is the next level of executable detail required to move forward. This step includes the development of partnerships with wireless carriers through a competitive bidding process. Terms of such a partnership should be negotiated with JPUD's financial goals in mind.
4. **Get the Detailed Business Plan approved by staff and commissioners.** The Detailed Business Plan will provide in-depth detail about every aspect of the broadband business. This Plan will establish the new entity with the ability to accept and apply for grant funding, attract ISPs, and to start building a

broadband network in a cohesive and prioritized manner in preparation for delivering services.

CHAPTER 1

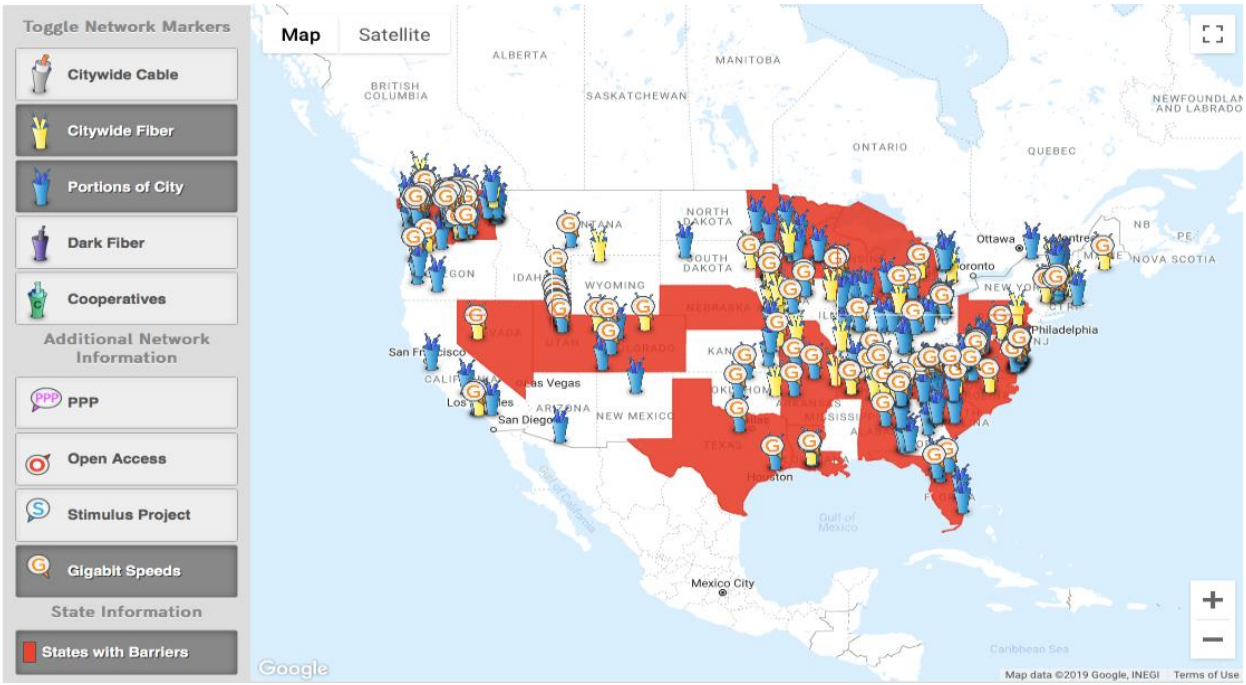
Broadband Background

BROADBAND BASICS

Local governments and utilities are charged to make wise investments in infrastructure for the communities they serve. Electric service has traditionally been their domain; however, broadband internet access has become an essential service that many organizations supply to their customers today. About 200 municipalities and utilities and about 285 electric cooperatives in the US provide these types of broadband services, utilizing fiber-optic technologies to deliver very high, symmetrical speeds, and reliable services. Cities and utilities are accustomed to excellent service and community support, which has led their charge into broadband, coupled with responsiveness to their customers' needs for faster, more reliable internet.

Figure 1-1 illustrates these providers today, including municipalities and utilities (including cooperatives). Municipalities and utilities that supply internet services to their customers generally do so by retailing these services. They provide internet access as well as customer service, support, and maintenance management of all services.

Figure 1-1: Municipal & Utility Broadband Networks



Many local governments already maintained their own fiber networks in their organizations to serve municipal or electric utility needs. The networks began to expand with greater demand for internet access and connectivity. Utilities saw this as an opportunity to help their local communities and improve the usage of these assets, many of which had excess capacity.

Utilities have taken notice and, in some cases, they've expanded access to their own fiber to allow local businesses, government organizations, schools and even broadband providers to use this high-speed infrastructure. In other cases, they have taken a community-wide approach to expanding broadband services for all residents and businesses, in the same way they have done with electricity, serving 100% of their territories. They bring the same culture of service that they've cultivated in the electric utility to the broadband world. They utilize their expertise in planning, building and maintaining infrastructure to support the transition into these new business ventures.

Many different approaches have been used by utilities to deploy Fiber-to-the-Premises ("FTTP") networks in their communities and several feasible broadband deployment and operations strategies exist. What has been learned over this period is that no "cookie cutter" model exists to replicate the successes that some utilities providers have enjoyed, such as Chattanooga Electric Power Board, TN, Longmont Power & Communications, CO and Lafayette Utility Systems, LA.

However, challenges are always evident, and utilities must be very careful in their approach to providing broadband services, as it is a new business endeavor and one that many are not accustomed to. Utilities must determine accurate costs, prices, take rates and operational plans to manage their networks. They must learn to compete, which is a significant undertaking that is not generally a part of utility culture.

Most importantly, their plans must be well-executed to achieve the customers needed to sustain their networks financially. These are significant undertakings that take the right mix of organizational structure, management experience, operational cohesiveness and funding. Organizations such as Ashland, OR, Burlington, VT and Wilson, NC all experienced significant challenges in deploying services. In the case of Burlington, VT, the system was eventually sold to an operator in 2018 after being rescued by a private investor that co-funded operations with the City for nearly a decade.

Fiber networks also create positive social and economic benefits to communities. Many public utilities have enabled improvements throughout the communities they serve in terms of economic and community development, education, healthcare and citizen engagement. These benefits are often called "off balance sheet benefits", or

intangible benefits, because the value of the benefits are real to the community, even though they may not show up on a pro forma or balance sheet.

Therefore, as part of the overall broadband equation, the JPUD's leadership should always keep in mind the additional benefits realized through serving its community organizations with high-speed connectivity, including schools, hospitals, local governments, and non-profit organizations. The network provides a lift to all these organizations in addition to an additional revenue stream to the community above and beyond the consumer broadband market.

WHY UTILITIES ARE INVESTING IN BROADBAND

Enhancing Utility Capabilities

Fiber networks provide a high-speed communications platform that allow electric utilities to deploy new electric grid modernization capabilities. Distribution utilities leverage their investments in fiber to support a number of these applications, such as recloser deployment, which enables millisecond changes to the electric grid to route around line failures and real-time demand-response technologies that enable utilities to manage demand, capping peak-hour load, and reducing electric costs.

Other applications include:

- Automatic reconfiguration of distribution resources with 50-millisecond switching capabilities to reduce or remove the impact of interruptions;
- Real-time monitoring of distributed energy resources as they grow within the utility territory;
- Reliable connectivity to support future behind-the-meter programs to help manage demand;
- High-security dark fiber penetrating further into the distribution system to support the grid modernization applications; and,
- Future deployment and integration of electricity storage resources to support plug-in electric and hybrid electric vehicles.

Utility Based Applications

Supervisory Control and Data Acquisition (SCADA)

Supervisory Control and Data Acquisition systems are connected to the internet, many times wirelessly, for the objective of gathering real-time data for decision making. Modern day SCADA systems can take data, analyze it, and send commands back to the system. Additionally, the systems can forecast or make predictions based on historical data, assisting PUD's with planning activities. These networks can achieve cost savings, better maintenance, and improved service for citizens. PUD's, however, should

consider and plan for possible errors in communications, the additional cost to implement, and mitigate cybersecurity possibilities.

Electric Smart Grids

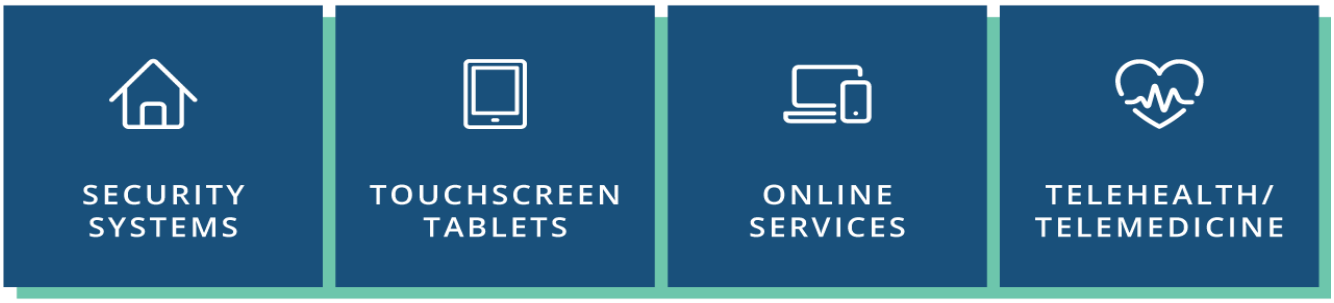
Connected smart grids for electric utilities can save communities time, energy, and carbon footprint. These grids connect to the internet allowing for real-time communication of meter reading, issues, and outages. This decreases the need for vehicle drives to read meters and aids technicians in being prepared for service calls. JPUD has allocated future funds in their planning processes to upgrade their system with new and improved "smart" meters.

Smart Light Pole Grids

By establishing a grid for smart light poles, municipalities can automate and control their lighting effectively and efficiently. These streetlights have LED lighting saving in recurring costs, although by allowing for dimming and brightening when vehicles and pedestrians come near saves additional cost. The PUD's fiber can help facilitate municipalities desires to improve services through technology.

Serving Residents

In communities throughout the US and around the globe, internet has become the new utility, similar to electricity, water, and gas. For residents in all areas, connectivity is necessary to maintaining their way of life. High speed broadband enables many aspects of how we live, from health and safety to work and entertainment.



Modern security systems, for example, protect homes via broadband connections. Residents also rely on high-speed internet connections to work from home, to locate and acquire products and services, and to keep in touch with friends and family via email and social media. Students require connectivity to perform homework, often done on a touchscreen tablet instead of paper. The elderly and infirmed are able to visit a doctor without leaving their house, allowing for better healthcare and aging in place, even in remote communities. These connections enable and enhance daily life, making high-speed internet a vital consideration in where people choose to live, prompting utilities to explore options for serving customers with this new utility.

Environmental Uses and Applications

Monitoring environmental factors can produce data that can be shared, analyzed, and assist in making decisions in relation to quality of life and health of the residents of Jefferson County and wildlife in and around the area. Technology and monitoring systems might assist in forecasting issues and learning from the data to manage issues in the future. Small cell devices and 4G/5G technology could bolster this data. Environmental sensors are typically used to monitor:

1. Air quality
2. Water quality
3. Rainfall
4. Humidity
5. Temperature
6. Barometric pressure

Reducing Lead Times for Service

The time to install and activate a customer's broadband services is significantly determined by the availability of infrastructure in the area. The industry standard lead time for activation of fiber-optic broadband services is 30 to 60 days in most markets where broadband providers operate. In many cases, the lead time may double or triple depending on how much additional fiber construction is necessary to reach the end user's location. Utilities improve the customer experience by deploying FTTP services throughout their regions to reduce the overall lead times for installation.

Enhancing Economic Development

It is apparent that technology has become embedded into our economy and culture. From smartphones to social media, digital currency to smart infrastructure, our lives, on both an individual and a mass scale, have become inseparable from the devices and information that ensure a constant connection to those around us. Naturally, our economy has followed suit: virtualization has allowed for dynamic changes in the ways that we conduct business across every sector. With improved collaboration, open source information, expansive globalism, crowd-sourcing, and a proliferation of start-up entrepreneurship, we find ourselves in a technology-based economy.

Attracting new businesses while enabling those that are already present is the focal point of many communities' economic development strategies. Ensuring that businesses have access to broadband is vital to attracting and retaining businesses in JPUD's service area.

The Digital Divide

Among the most important considerations in the digital, global economy is ensuring equitable access to the opportunities brought about by these technologies. Because high-speed internet is necessary to employment opportunities, education, and identifying social resources, areas in which broadband is unaffordable or unreliable are at a distinct disadvantage. Many skilled jobs now require a level of digital literacy and availability, and increasingly, schools are incorporating online learning into their curriculums. Although technology provides clear advantages for communities and individuals across a variety of sectors, a schism has emerged, separating those who have broadband access from those who do not. These disparities result in an alarmingly high number of people, typically those in poverty or low-income households, who the tools they need to be successful in education, apply for health insurance, or have the digital literacy necessary in today's economy.

Policy makers and advocacy groups have termed this disparity the "digital divide, or the digital split, as a social issue referring to the differing amount of information between those who have access to the internet (especially broadband access) and those who do not have access."[1] Efforts for closing this divide are active and several elements of "digital inclusion" have been defined by the National Digital Inclusion Alliance to close these gaps, including:

1) affordable, robust broadband internet service;
2) internet-enabled devices that meet the needs of the user;
3) access to digital literacy training;
4) quality technical support; and
5) applications and online content designed to enable and encourage self-sufficiency, participation and collaboration."[2]

Cities and counties are increasingly taking note of these inequities and their economic and social consequences. To mitigate these pitfalls, many are commissioning plans such as this one, in which local organizations take action in ensuring the needs of all citizens are met through the use of policy, expansion of existing networks, and the creation of infrastructure to fill those gaps. Communities across the United States are trying to bridge the digital divide through using tools of digital inclusion to ensure all citizens and students have access to the tools that they need to function within the 21st Century workforce, environment, and society.

[1] ICT Information Communications Technologies. (2018) The Digital Divide, ICT and Broadband Internet. https://www.internetworldstats.com/links10.htm
[2] NDIA. (2018) Definitions. https://www.digitalinclusion.org/definitions/

In rural locations such as Jefferson County, issues of the digital divide are readily apparent. Due to the unique topography of the area and low population density, many internet service providers are not incentivized to build infrastructure supporting the region since doing so would cost more money than they could expect to earn from servicing customers in these remote locations. Throughout this report, and particularly in the Market and Needs Assessment sections, the issue of the digital divide in Jefferson County is pervasive. Community members who participated in Magellan's online survey, as well as those who attended the focus group sessions, indicate a clear lack of access to broadband services throughout the area, negatively affecting prospects for education, economic development, and day-to-day quality of life issues. These concerns make Jefferson County a prime location for digital inclusion efforts, including state and federal efforts to bridge the divide.

Preparing for Smart City Technologies

Municipalities across the world are deploying technology infrastructure and systems to support ubiquitous connectivity across their regions. Local governments and utilities are connecting more devices and community infrastructure components to support a smarter community. While local governments have historically focused on connecting buildings and public sites to their networks, future demands will drive connectivity to water and wastewater systems (well points, lift stations, pump stations, AMI collectors), stormwater systems (manholes, weirs, structures), greater levels of surveillance (cameras, sensors, vehicles), as well as new transportation technologies.

Smart City initiatives deploy digital technology to control public assets, generate data, and make municipal services—and citizens' lives—better. The results can be huge bottom-line gains including reducing energy consumption, manual labor, component failures, vandalism, and other costs. Smart Cities can also generate additional benefits and revenue by enhancing current services or offering new services. Online and self-serve rentals, data brokering, and advanced connectivity are a few examples. Needless to say, these opportunities involve substantial investments in hardware, and require workforce up-skilling. They can also have big connectivity requirements.

A recent study and report by Deloitte noted that "Deep deployment of fiber optics into our nation's network infrastructure might not be as glamorous as the eagerly anticipated launch of fifth-generation mobile networks (5G); however, it is just as important—if not more so. In fact, 5G relies heavily on fiber and will likely fall far short of its potential

unless the United States significantly increases its deep fiber investments."[3] The study estimates that the US will need to invest $130 - $150 billion in the next 5-7 years in fiber infrastructure in order to support the roll out of next generation wireless.

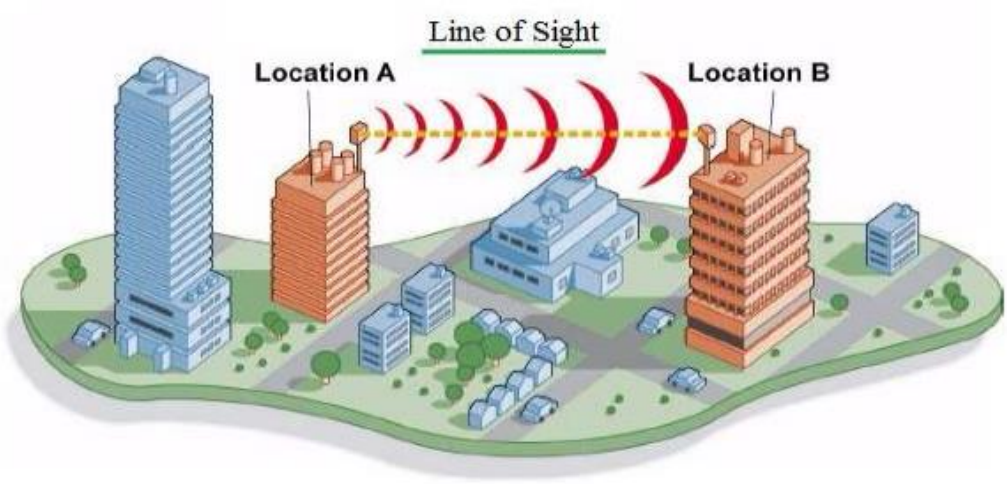
The Future of Wireless

Wireless broadband can operate as mobile wireless or microwave fixed. Fixed wireless can be used to connect remote locations or sparsely populated areas, where DSL or cable service would not be economically feasible, via long-range directional microwave antenna.

Fixed wireless services allow consumers to access the internet from a fixed point while stationary, and typically requires an external antenna with direct line-of-sight between the distant wireless transmitter and the customer building-mounted receiver. Speeds are generally comparable to DSL and cable modem. These services have been offered using both licensed spectrum and unlicensed devices. To deliver a fixed wireless solution, providers need to consider a few things:

- Available and appropriate spectrum – not all spectrum is created equal
- Tower locations and siting
- Terrain and form of interference
- Backhaul options
- Bandwidth requirements

Figure 1-2: Wireless Network Diagram



Wireless (and cellular) signals travel through the air via wireless spectrum. This spectrum is not an infinite resource; there is only so much available. While technology

[3] https://www2.deloitte.com/us/en/pages/consulting/articles/communications-infrastructure-upgrade-deep-fiber-imperative.html

continues to improve the amount of bandwidth that can be delivered over a set amount of spectrum, spectrum is still limited. Spectrum in the US in managed by the Federal Communications Commission (FCC), which establishes rules for how spectrum is to be used, who has the rights to use it, and then works to govern the use of that spectrum.

Spectrum is licensed for radio (FM/AM), TV broadcast, military communications, airlines, satellites, emergency use, ship-to-shore communications, cellular communications and many others. Blocks of spectrum are basically lumped into two buckets: licensed and unlicensed spectrum. Unlicensed spectrum can be used by anyone who agrees to "play nice" within that spectrum. Wi-Fi is an unlicensed spectrum that the FCC has made available for anyone to use as long as rules are adhered to. Carriers generally do not deploy services in unlicensed spectrum because they would have a difficult time providing any type of guaranteed quality of service to their end users.

Getting high bandwidth broadband and the ability to penetrate walls and terrain is a balancing act. Spectrum in the lower ranges offers better non-line-of-sight solutions, whereas the higher spectrum ranges need a more line-of-sight solution, requiring the transmitting antenna to be able to "see" the receiving antenna with limited trees and buildings in the way to be effective.

Terrain, then, plays an important role in the network design. Spectrum does not get over mountains or hills very well, nor does certain spectrum do very well in penetrating through trees, bushes, water or distance. The farther away the transmitter and the receiver are from each other, the less bandwidth is available. Transmitter sites need a means of connecting to the network, whether via fiber or microwave to another site where it then transitions to a wireline fiber network. Fiber can be costly to install to remote locations. Electrical power, security and access are also considerations when locating appropriate tower sites.

Spectrum and wireless solutions as they apply to JPUD will be discussed further in the Business Models section of this document. While JPUD may have access to "some" spectrum, not all spectrum is appropriate as a last mile fixed wireless solution.

5G Mobile Wireless

The fifth generation of mobile wireless networks, known as 5G, is being designed and developed, with forecasted commercial availability in 2020 and an increased maturity of the network in subsequent years. 5G networks operate multiple frequencies using millimeter (very high in the spectrum range) wavelengths to offer anticipated download/upload speeds of 1 Gbps. The networks are designed to provide increased efficiencies while decreasing latency and are designed for improving the performance of connected devices that define the Internet of Things. Examples include autonomous vehicles, healthcare monitoring technologies, ultra-high-definition video, virtual reality, and many more applications that are ripe for development.

Many of the large national cellular providers are using 5G solutions to deliver FTTH like services and speeds to regions in lieu of fiber given the potential to lower their capital expenses, while still maintaining equivalent service definitions. A wireless carrier could use 5G technologies to offer services within the JPUD service territory should the PUD partner with them. They have the expertise and spectrum assets to make it a viable solution. Assets the PUD does not have by themselves.

CHAPTER 2

Current Environment

The Jefferson County Public Utility District (JPUD) provides traditional public utility services of water, sewer, and electricity for Jefferson County, Washington. The county is located on the Olympic Peninsula, essentially across Puget Sound to the west of Seattle. In 2010,[4] Jefferson County had a population of 29,872. The county seat of Port Townsend is the only incorporated city in the county and has a population of approximately 9,500.

Jefferson County is divided into three parts due to its unique landforms. Western Jefferson County is considered the rural communities along the Pacific coast, while central Jefferson County contains the Olympic Mountains and the Olympic National Park and remains largely uninhabited and undeveloped. Eastern Jefferson County includes the more developed and populated communities of the peninsula along Admiralty Inlet and the Hood Canal.

Figure 2-1: Map of the JPUD Service Area

Due to the mountains, there are no roads that connect the eastern and western part of the county without the need to travel outside the county and around the Olympic Mountains and the surrounding public lands. In fact, federal lands make up 62% of the

[4] Source: U.S. Census Bureau, 2010 ZCTA decennial census, Community Facts, https://factfinder.census.gov

total land area of the county, with only 21% of the land area of county being privately owned.

Port Townsend was founded in 1851 on the speculation that it would become the largest harbor on the west coast. While not growing quite to the scale that the founders envisioned, JPUD's eastern communities have grown and sustained themselves due to their ideal position along shipping and transportation corridors. Jefferson County benefits from access to different modes of commodity transportation that supports logging, manufacturing, and maritime industries in the region.

Contributing to Port Townsend's inability to become a large harbor city was that during the buildout of the nation's railroads in 1880-1890s, rail never came to Olympic Peninsula. Maritime ports need the ability move freight intermodally, and in the 1890s, some decades before motorized freight and highway systems were invented, the railroad system was vital. Unfortunately, the railroads never grew west of Puget Sound, and in the 1920s, the rail infrastructure was not there to support the local economy through the depression era. As a result, the population of the area declined, and Port Townsend and the county fell stagnant.

Economic conditions in JPUD communities have stabilized in recent decades and the outlook remains favorable as the regional economy prospers. The JPUD service area benefits from proximity to federal employers, such as the US Navy and the National Park and Forest Services, and cornerstone local employers like the Port Townsend Paper Mill and Jefferson Healthcare. The county has international commercial air access to the Seattle-Tacoma area, which lends important support to a steady tourism economy anchored by Olympic National Park and the Pacific coast.

So today, amid the growth of fiber-optic infrastructure deployment, with broadband growth and innovation by municipalities and utilities throughout the nation, Jefferson County and Port Townsend find themselves once again striving to deploy an economically vital infrastructure west of Puget Sound. The county can no longer allow the lack of modern infrastructure to keep it isolated from social and economic growth opportunities. Jefferson County, Port Townsend, and JPUD find themselves in a challenging position as they work together to increase the availability of broadband for the social and economic vitality of their communities.

JPUD'S CURRENT FIBER-OPTIC NETWORK

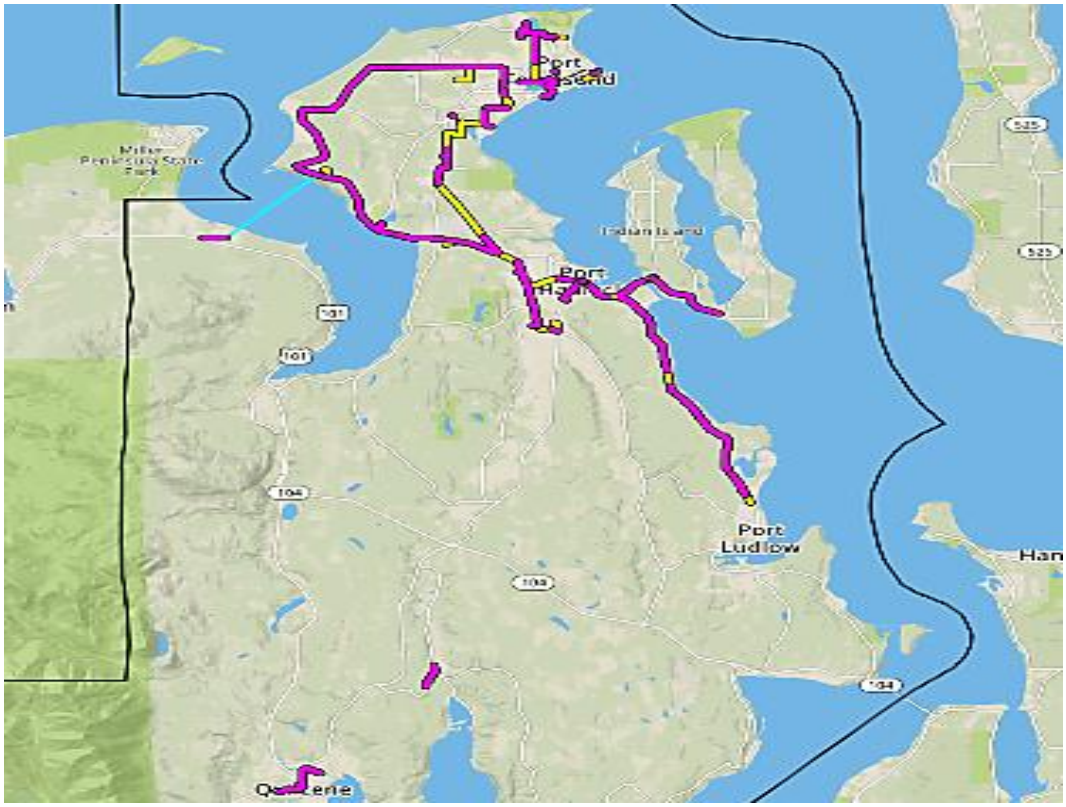
The JPUD is a public utility providing traditional utility services of water, sewer, and electricity. Like many other rural utilities, telecommunications are a relatively new venture for JPUD. In 2011, a partnership with the statewide middle mile network NoaNet was formed, and through American Recovery and Reinvestment Act investment, JPUD started building fiber to select community anchor institutions in Jefferson County that NoaNet would then serve.

In the time since the ARRA grants, JPUD has built additional segments of fiber to allow for utility SCADA operations. Now JPUD is considering more fiber segments to build, plus it has excess capacity in some parts of its service area that could provide opportunity for improving residential and business broadband services to JPUD customers.

Washington law allows for JPUD to own fiber-optic cables, and it can use those fibers for internal purposes, as means of directing investment and service provisioning, or it can lease strands of fiber to others. This means that in order for a JPUD's network to grow and service broadband services, a Washington PUD can either form a partnership with a retail provider, or it can deploy its own fiber and lease portions of the fiber to one or more broadband providers as a wholesale customer relationship, which would then turnaround and provide retail broadband services to homes and businesses.

Today, JPUD has its own fiber in locations of eastern Jefferson County. As seen in Figure 2-2-2, JPUD has fiber in the Port Townsend area that extends down to near Port Ludlow. There are also some individual segments of fiber that serve specific purposes in other areas.

Figure 2-2: JPUD Current Fiber



The lack of customer density within the service area presents difficult issues for JPUD as it looks to build out more fiber across its service area network. Primarily, building out more fiber deeper into its service area is a costly venture, and the current practice of JPUD asking customers to help aid the construction costs to build infrastructure to new locations is not very popular. This proved to be a troublesome proposition during the ARRA-funded builds, as many community anchors chose not to sign up.

In terms of using JPUD-owned fiber for broadband services, law in the State of Washington dictate that a public utility district (PUD) cannot sell retail broadband services to households or businesses. Such PUDs can still participate in the local broadband ecosystem at a wholesale level, by supporting retail broadband providers in its service area. As such, the state law encourages PUDs to partner with private sector service providers to manage the retail customer relationship.

Today, service providers in the JPUD service area are limited in the scope of their service offerings partly because of the capital necessary to build higher capacity networks to reach more prospective customers. Like any other business, these retail internet service providers think that they cannot achieve a reasonable return on investment, or else the retail broadband providers would have fully upgraded their networks in JPUD service area communities.

By owning its own fiber, JPUD can reduce its own recurring telecommunications service fees and can provide revenue opportunities while it helps to improve broadband availability and quality in the service area. In this way, owning fiber creates a measurable asset that reduces recurring costs while also providing a valuable infrastructure for its service area.

CHAPTER 3

Analysis of the Current Broadband Market

INTRODUCTION

Over the course of several months, Magellan Advisors' team worked with Jefferson PUD's leadership and key staff to create a plan tailored to the PUD's community and service territory's specific needs and capabilities.

To do this, stakeholder outreach was performed throughout the development of this Plan to better understand the broadband needs in the region. Magellan and the PUD created an online Business and Residential Broadband Survey to collect an understanding of sentiment about broadband in the County. The team also held stakeholder interviews with municipal departments, businesses and anchor institutions located in the region.

The survey and these outreach sessions gathered feedback about the current state of broadband and technology, future plans that would necessitate high-speed internet access, and how the PUD could approach ensuring adequate broadband speeds at affordable prices, with greater choice of providers, and high levels of reliability and customer service. Findings of this outreach are presented and discussed below.

To better understand the availability of broadband in the Jefferson PUD serving area, a market analysis was completed assessing the options available to the County's small and large (enterprise) businesses and anchor institutions. The analysis focused on internet speeds and pricing from commercial service providers. This section summarizes the findings of this research and makes observations regarding the services currently offered in service area. Residential and mobile broadband offerings are also briefly summarized. The assessment then addresses the state of competition and effects on costs, speeds and quality of services.

The conclusion of these findings supports the enablement of increased competition and consequent downward price pressures on service offerings to allow for more affordable, reliable high-speed broadband options for the area's residents, businesses and anchor institutions.

ASSUMPTIONS AND DEFINITIONS

For purposes of this analysis, "broadband" is defined as minimum speeds currently specified by the Federal Communications Commission (FCC). As of January 2015, the FCC defines "broadband" as a minimum of 25 megabits per second (Mbps) download

speed, and 3 Mbps upload speed. In January 2018, the FCC reaffirmed that definition. (As an example, speeds will be quoted as 25 down / 3 up (Mbps), or 25 / 3.) Gigabit speeds represent 1000 megabits; e.g. 1 Gbps = 1000 Mbps.

Everyone may have their own definition of what broadband means to them. Some may not actually have a speed definition, but rather an "I can do this, or I can't because my connection is too slow" definition. Some may consider 25/3Mbps as not being broadband, but for this report, and for definition in the survey, we have adopted the FCC's recommendations. In reality, the FCC would increase their definition, but if it does so, it would then be required to increase its subsidies and funding mechanisms it provides carriers to meet those new expectations. It is felt that if the FCC increased it to 100Mbps, it would then exclude DSL as a supported technology and then have to increase funding to build FTTH networks given DSL cannot deliver (economically) 100Mbps speeds. There is a lot of DSL networks still in existence. FCC support for broadband is about $6B annually. If it was to dictate a higher speed, and the funds to support that higher speed, funding would have to increase exponentially.

Identical download and upload speeds are termed "symmetric". But in most cases, Magellan finds that download speeds far exceed upload speeds (i.e., "asymmetric"), and typically, only download speeds are advertised. As businesses and consumers publish increasing amounts of data-rich web content such as videos, photographs, other social media, today's "slower" upload speeds will have a greater adverse effect on overall user experience; thus, demand for faster upload speeds and symmetric services will accelerate.

Where cited, costs will be classified as non-recurring costs ("NRC", or "one-time costs"), typically required up front for service installation. Monthly fees for service, or monthly recurring costs ("MRC") represent recurring payments, which may or may not be part of a subscription tied to committed service term. Quoted costs are exclusive of federal and local taxes, subscriber fees, Universal Service fees, and equipment rental costs. Often, the existing providers will also advertise teaser rates, good sometimes for only 6 months, then revert to their usual rates.

Notably, much of the data represented here is self-reported by the incumbent internet service providers (ISPs) that serve the Jefferson County area. These statistics measure availabilities based on the vendor's ability to service that proportion of the region's businesses or residents as a percent of the total businesses or residences in the area, respectively.

To supplement this self-reported information provided by the incumbent ISPs, Magellan conducted a broadband survey that measured actual speeds and asked area businesses to report on actual costs and availability of high-speed internet. This

information will be used as a part of this market assessment to gain a more objective view of the broadband market in the PUD serving area.

Additional questions were also asked of respondents to generate a clear picture of their sentiment about broadband in this region. These additional findings are detailed in the Needs Assessment section of this document.

INCUMBENT TELECOMMUNICATION SERVICE PROVIDERS

According to self-reported data from incumbent internet service providers, Jefferson County has a total of 9 internet providers (5 offer residential, 3 offer business and 4 mobile). The figure below displays a summary of options available to residents and businesses in the area.

Figure 3-1. Summary of Internet Providers in Jefferson County[5]

Provider	Type	Fastest Speed
Century Link		
Residential	DSL	100 Mbps
Business	DSL	100 Mbps
Wave		
Residential	Cable	1Gbps
Business	Cable	1Gbps
North Olympic		
Residential	Fixed Wireless	20 Mbps
Viasat		
Residential	Satellite	25 Mbps
HughesNet		
Residential	Satellite	25 Mbps
Silver Star Telecom		
Business - Enterprise	Fiber	10 Gbps
AT&T	Mobile	10 Mbps
Verizon	Mobile	10 Mbps
T Mobile	Mobile	10 Mbps
Sprint	Mobile	.1 Mbps

Overall, average reported download speeds are low. Only in Port Townsend and Port Hadlock are these reported speeds meeting the speeds defined by the FCC for broadband.

[5] Source for all self-reported data is Broadband Now. www.broadbandnow.com; accessed 8/19/2019

Actual speed test results collected through Magellan's broadband survey will be discussed in the Market Assessment section of this report.

Figure 3-2. Average Reported Download Speeds

Location	Average Reported Download Speed
Port Townsend	53.95 Mbps
Port Ludlow	4.65 Mbps
Port Hadlock	26.66 Mbps
Quilcene	12.52 Mbps
Chimacum	21.48 Mbps
Brinnon	14.27 Mbps
Nordland	6.62 Mbps

For small business entities in the area, broadband coverage appears to be available in a larger portion of the County. However, competition is limited, with just two (2) providers (Century Link and Wave) offering ser*vice to most areas. North Olympic also offers broadband service to 94% of businesses in Chimacum, 30% in Norland, and 17% in Port Ludlow using predominantly a fixed wireless solution. The other providers have very minimal coverage at this time. Customer satisfaction ratings are average, at best, for all providers.*

Figure 3-3. Summary of Internet Providers in Jefferson County (By City/Zip)

City / Zip	Pop.	Provider	Coverage (Res)	Coverage (Bus)	Type
Port Townsend (98368)	14,724	CenturyLink	98%	65%	DSL
		Wave	97%	62%	Cable (Fiber Based)
		North Olympic	17%	17%	Fixed Wireless
		Silver Star		100%	Fiber
Port Ludlow (98365)	4,528	CenturyLink	98% / 5%	76%	DSL / Fiber
		Wave	98% / 11%	78% / 7%	Cable / Fiber
		North Olympic	10%	10%	Fixed Wireless
		Silver Star		100%	Fiber
Port Hadlock (98339)	3,326	CenturyLink	99%	84%	DSL
		Wave	98%	83%	Cable (Fiber Based)
		North Olympic	41%		Fixed Wireless
		Silver Star		100%	Fiber
Quilcene (98376)	1,998	CenturyLink	85%	64%	DSL
		Wave	39% / 11%	19% / 8%	Cable / Fiber
		NoaNet		5%	Fiber
		Allstream		4%	Fiber
		Silver Star		100%	Fiber
Chimacum (98325)	1,848	Century Link	93%	94%	DSL
		Wave	77%	76%	Cable (Fiber Based)
		North Olympic	94%	94%	Fixed Wireless
		Allstream		3.5%	Fiber
Brinnon (98320)	1,250	Century Link	23%	16%	DSL
		Wave	38%	11%	Cable (Fiber Based)
		Silver Star		100%	Fiber
Nordland (98358)	897	Century Link	94%	41%	DSL
		Wave	5%	5%	Cable (Fiber Based)
		North Olympic	30%	30%	Fixed Wireless
		Silver Star		100%	Fiber

Additionally, Satellite Internet Providers (Viasat and HughestNet) offer 100% coverage to all zip codes at speeds up to 25 Mbps. Earthlink also reported residential service (fiber connectivity) in some areas, but coverage percentage was not available. Silver Star Telecom offers fiber connectivity to enterprise/large business customers.

Competition is sparse as many businesses have just two choices of providers, causing prices to be high and service to be relatively insufficient.

As noted, Century Link and Wave are the two primary wired internet providers and they cover the majority of the PUD service area.

Most small or medium businesses can subscribe to DSL (Century Link - 100 Mbps) or Cable (Wave – 1Gbps), with North Olympic offering a fixed-wireless solution but at

only 40 Mbps, but as with everything wireless, subject to change. There are also four mobile internet providers in JPUD's service territory that claim to provide 100% availability throughout the area including AT&T, Verizon, T-Mobile, and Sprint. Mobile wireless, which can be used for broadband, is also ubiquitous, but the data plans are extremely limited, and costs are exorbitant. Mobile wireless data unit costs are most expensive, and caps are quickly reached. However, with good coverage, we did see many end users report they rely on their mobile solutions as their broadband solution as it is often times faster than what they can get with DSL.

Only two providers offer fiber-based broadband. Silver Star offers fiber to large (enterprise) businesses in select areas, and Wave offers fiber in a few select markets, but covers only 11% of residents and 8% of businesses in those markets as of this writing. As a result, competition for fiber-optic based high-speed broadband services is very limited. Consequently, recurring costs are high. One-time connection and installation costs may be waived, or otherwise seemingly low, but those provider costs are included in the monthly recurring costs.

WAVE

Wave serves residential, business, and enterprise solutions for internet, television, and phone customers throughout Washington, Oregon and California. Their service is available in about 140 cities on the west coast of the US. Advertised rates in Jefferson County are displayed in the table below.

Figure 3-4. Wave Service Offerings

Package	Price	Speed/Inclusions
High Speed 10/1	**$42.95** per month	Speeds up to 10/1 Mbps. 2-year contract
High Speed 100/10	**$69.95** per month	Speeds up to 100/10 Mbps. 2-year contract
High Speed 250/10	**$79.95** per month	Speeds up to 250/10 Mbps. 2-year contract
Gig	**$99.95** per month	Speeds up to 1000/30 Mbps 2-year contract

CENTURY LINK

CenturyLink is a nationwide telecommunications company providing internet, phone, television, hosting, IT, and managed services to residential and business customers around the US. CenturyLink merged with Level 3 Communications in November 2017. Although the company offers Gigabit fiber service in some cities, in Jefferson County all offerings are serviced via DSL connections. Advertised offerings and packages include:

Figure 3-4. CenturyLink Service Offerings

Package	Price	Speed/Inclusions
Business Essentials	**$79.99** per month	Speeds up to 12/12 Mbps. 2-year contract. Includes phone service and free activation. Modem with Wi-Fi addtl $9.99 MRC or $99.99 NRC.
Business Advanced	**$89.99** per month	Speeds up to 20/20Mbps. 2-year contract. Includes phone service and free activation. Modem with Wi-Fi addtl $9.99 MRC or $99.99 NRC.
Residential Internet	**$45.00** per month	Speeds up to 10/10 Mbps. 1024 Gb data cap. Free self-installation or $125 professional installation. Modem addtl $10 MRC or $150 NRC.
Residential Internet	**$50.00** per month	Speeds up to 20/20 Mbps. 1024 Gb data cap. Free self-installation or $125 professional installation. Modem addtl $10 MRC or $150 NRC.

SILVER STAR

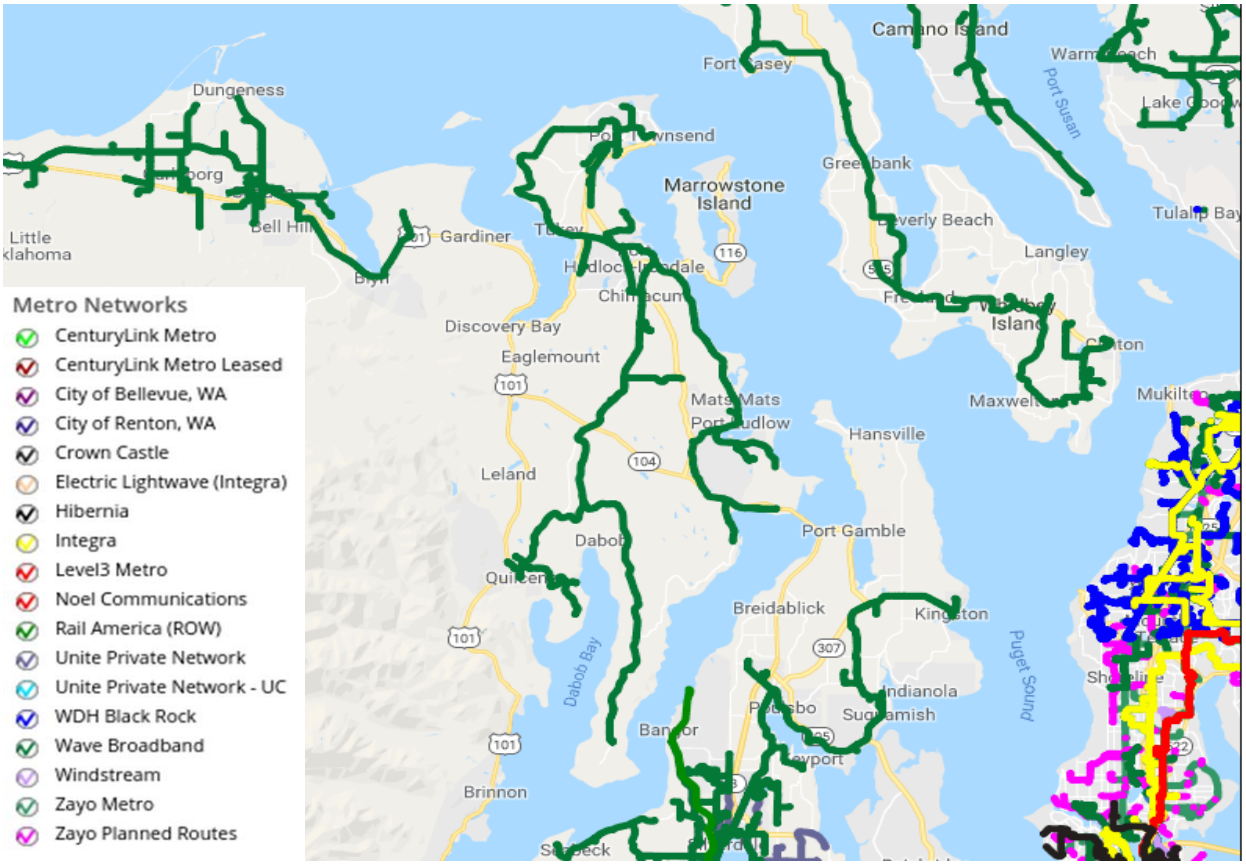
Silver Star is a Vancouver-based telecom company providing internet and phone services to businesses via fiber in select areas of Washington and Oregon. Although prices are not advertised, the company lists a variety of service tier options, including speeds of 5/5 Mbps, 10/10 Mbps, 20/20 Mbps, 50/50Mbps, 100/100 Mbps, and 200/200 Mbps.

Although Silver Star reports covering 100% of Jefferson County, they do not have facilities to support service throughout the area. It appears that no respondents to Magellan's broadband survey, residential or business, subscribe to their service.

SERVICE PROVIDER FIBER INFRASTRUCTURE

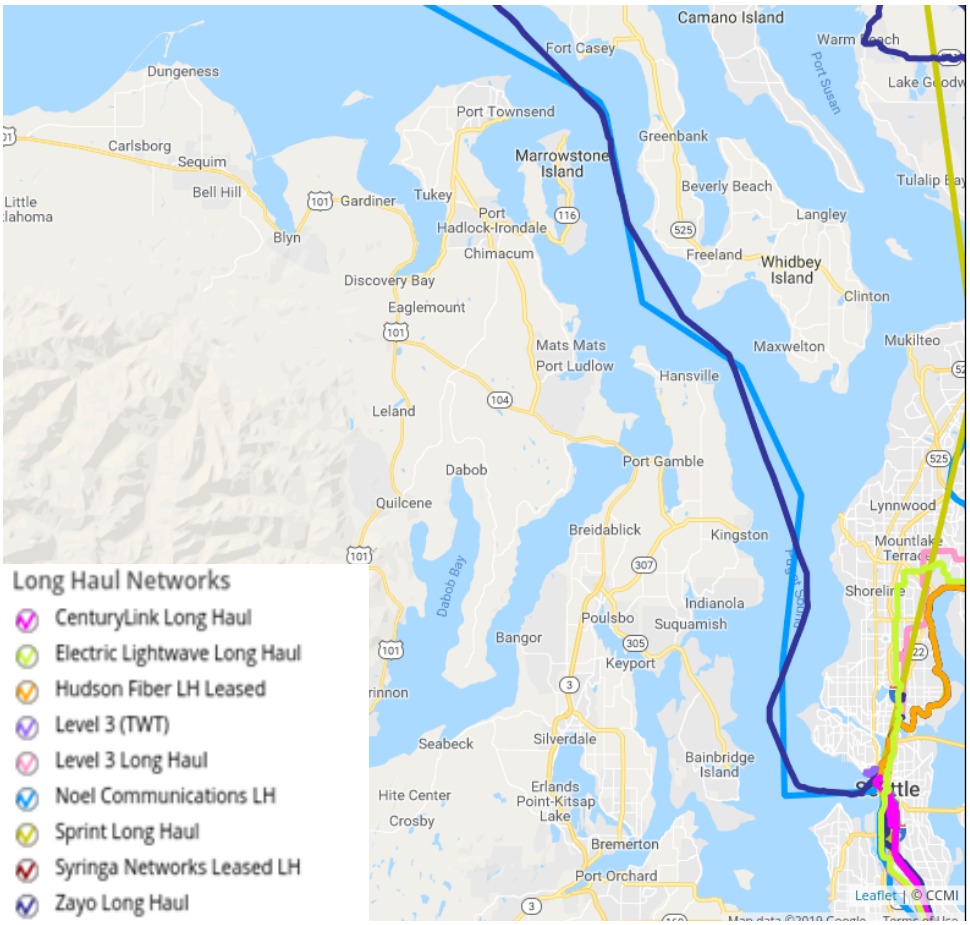
As seen in the figure below, Zayo is currently the only ISP with fiber infrastructure in the JPUD service area. Their metro routes cover a fair part of the populated areas in the northeast part of the County, but does not extend to Marrowstone Island, Discovery Bay, Brinnon, or many locations along the 101.

Figure 3-5. Existing Service Provider Fiber Infrastructure – Metro Networks



Both Zayo and Noel Communications also both have long-haul fiber networks running through Puget Sound with connections in Seattle.

Figure 3-6. Existing Service Provider Fiber Infrastructure – Long-haul Networks



CONCLUSION

This Market Assessment indicates that internet and broadband service offerings are relatively limited and expensive in JPUD's serving area, and that provider choice is also extremely limited. Adding another option for broadband to businesses in the area will increase availability of high-speed fiber-optic based broadband, having favorable effects on choice and value for services.

CenturyLink suffers from their relatively slow service and their inability to always deliver their advertised speeds. They self-report speeds that they advertise as being able to be delivered to all areas in within their coverage footprint. However, it has been reported, that typical of CenturyLink and DSL in general, DSL is still a best effort solution and may are not getting anywhere near what they feel they are paying for. CenturyLink also has communities that are out of DSLAM ports (a place to plug your

line into at the central office), too far from the CO to get reliable support, or the lack middle mile backhaul capacity that causes a bottleneck of aggregated data traffic resulting in slow speeds and throughput. Most respondents were very dissatisfied with CenturyLink service and especially frustrated that there are no alternatives.

CHAPTER 4

Needs Assessment

A key objective of this Plan is to gain additional insight into the needs of the PUD's serving area including, business organizations and residential consumers, as they pertain to high-speed internet. To ensure that these needs are addressed within the Plan, the project team performed several evaluative outreach tasks to engage with the region's community. The results of the data collected through these processes are provided in the following sections and comprise the Jefferson PUD's Serving Territory Broadband Needs Assessment.

METHODOLOGY

As part of the needs assessment process, Magellan Advisors' project team traveled to Jefferson County to have candid and open discussions with key staff, city leaders, community organizations, and business and community leaders. The primary goals of the meetings were to better understand JPUD's serving territory broadband market conditions and to learn about the broadband challenges of the people who live and work in the community and who try to operate their businesses with the broadband services available today.

Participants of these sessions indicated that they view high-speed internet connectivity as a necessity and explained what this type of access means to their individual organizations and roles.

The needs assessment for the region includes information from these discussions, as well as the results of a Broadband Survey conducted by Magellan Advisors and the PUD. This survey was launched in May 1, 2019 and remained open until July 19, 2019. There were 1,229 residential responses, 1,035 (84%) of which were complete, and 44 business & organizational responses, 30 (74%) of which were complete. Findings from the survey can be found at the end of this section.

STAKEHOLDER NEEDS

Feedback was directly heard from the community and its anchor institutions such as schools, Chamber of Commerce and civic leaders including the Mayor and City Manager of the City of Port Townsend, the Port of Port Townsend, the Chamber of Commerce, the IT dept of Chimacum School district, as well as several local ISP's and providers.

Participants were given an overview of the project including scope, purpose, and intended deliverables. To generate discussion, the participants were then asked about

their own satisfaction, experience, viewpoints, and needs as they related to broadband.

All of the participants stated that access to high-speed internet was integral to their business and that the lack of it was having detrimental effects on their ability to grow and deliver new products and services.

BUSINESS/ORGANIZATIONAL BROADBAND ASSESSMENT SURVEY

To give further context to this market research, Magellan Advisors created and administered a survey designed for the community to provide input to the Needs Assessment regarding their broadband usage in the region.

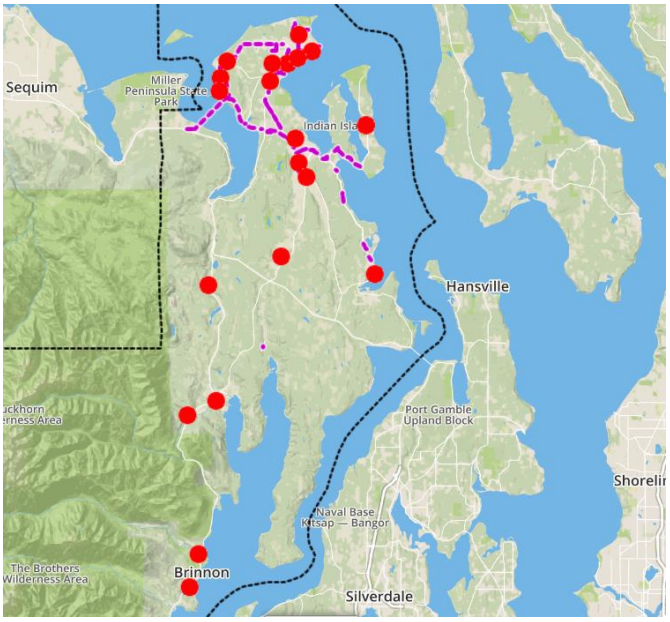
The broadband survey collected data from respondents about availability, contracted speeds quoted by their provider; what their actual measured speeds really are (collected electronically); services received (TV, telephone, website hosting, etc.), type of connection, speed and cost of internet services. This information provides richer detail about the nature of pricing, availability, quality of service, and competition within this broadband market.

At survey's end, 44 business/organizational responses were captured, with 30 respondents completing answers to all questions, and 14 completing answers to some questions. These partial responses included some usable responses and are therefore included in the data analyzed.

Figure 4-1. Business/Organizational Survey Responses by Completeness and Type of Internet Connection.

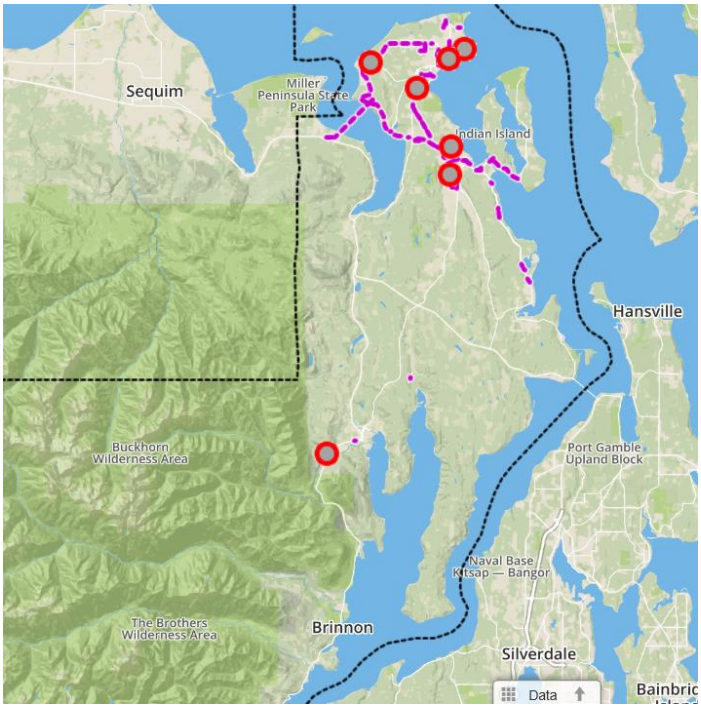
Response Type	All	Broadband Internet	No Internet	Slow Internet
Total	44	26	1	17
	100.0%	59.1%	2.3%	38.6%
Complete	30	18	1	11
	68.2%	60.0%	3.3%	36.7%
Partial	14	8	-	6
	31.8%	57.1%	0.0%	42.9%

Figure 4-2. Business Survey Response Locations



As shown in the Figure 4-1, just over half business respondents (59.5%) reported having broadband. Figure 4-2 displays all business survey response locations. The map below shows locations that did not have broadband, but did have slower speed DSL connections.

Figure 4-3. Business Survey Response Locations Slower Speed DSL



We also asked each respondent to list their business's organization type by North American Industry Classification System *(NAICS) code. The Agriculture, Forestry, Fishing & Hunting sector had the most respondents (18.9%), Other Services (Except Public Administration) (16,2%), Professional, Scientific and Technology (13.5%), and Educational Services at 10.8%. Most respondents (92%) indicated their headquarters was located in the area, with an average of 13 employees working at the location.*

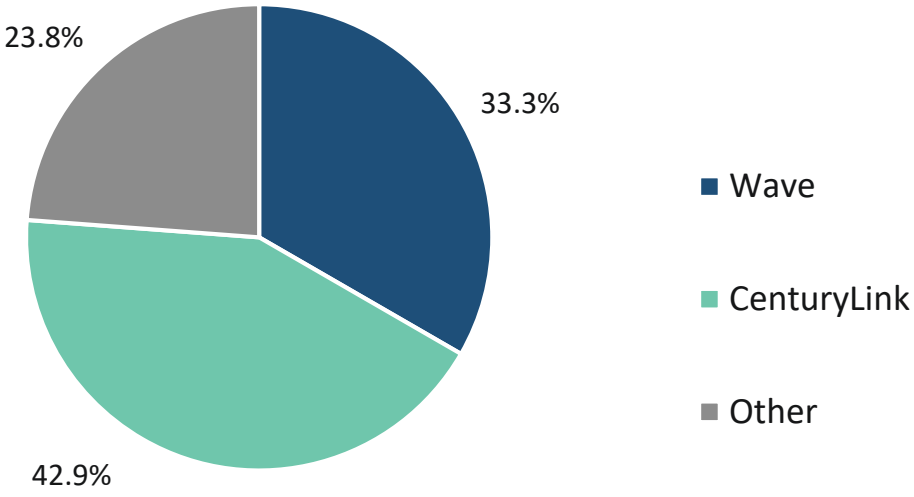
The figure below displays how these results compare to the population of businesses within JPUD's service area. As shown, we would have expected a higher response from some sectors, such as Construction, Retail Trade, Accommodation and Food Services, and Health Care and Social Assistance organizations. Conversely, higher than anticipated responses were received from the Agriculture, Forestry, Fishing and Hunting, Educational Services, and Other Services (except Public Administration) sectors.

Figure 4-4. Percentage of Responses by Sector Compared to Population

Sector **(NAICS)**	Responses	Population	Difference
Accommodation and Food Services (72)	5.4%	10%	-4.1%
Agriculture, Forestry, Fishing and Hunting (11)	18.9%	1%	17.7%
Arts, Entertainment, and Recreation (71)	2.7%	3%	0.2%
Construction (23)	5.4%	14%	-8.1%
Educational Services (61)	10.8%	2%	8.8%
Health Care and Social Assistance(62)	5.4%	10%	-4.1%
Information (51)	2.7%	3%	-0.1%
Manufacturing (31)	2.7%	6%	-3.5%
Other Services (except Public Administration)(81)	16.2%	11%	5.7%
Professional, Scientific, and Technical Services(54)	13.5%	11%	2.7%
Real Estate and Rental and Leasing(53)	5.4%	5%	0.2%
Retail Trade (44)	8.1%	13%	-5.2%
Wholesale Trade (42)	2.7%	3%	0.0%

Most respondents to the survey reported subscribing to either Century Link (43%) or Wave (33%). Other providers (in written responses) *included Marrowstone Wireless, North Olympic Data Centers, or North Olympic Peninsula Data Centers.*

Figure 4-5. What Company Provides Broadband to Your Location?



Cable was the most reported connection type (28.6%), followed by DSL (28.6%), and dedicated line (14.3%). A significant number of respondents (14.3%) were unsure about their connection type.

Figure 4-6. How is This Location Connected to the Internet?

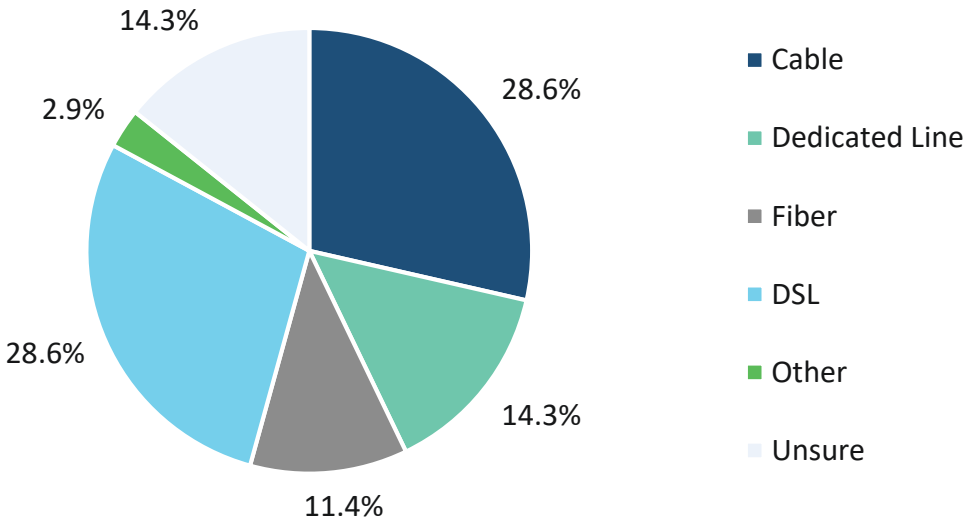
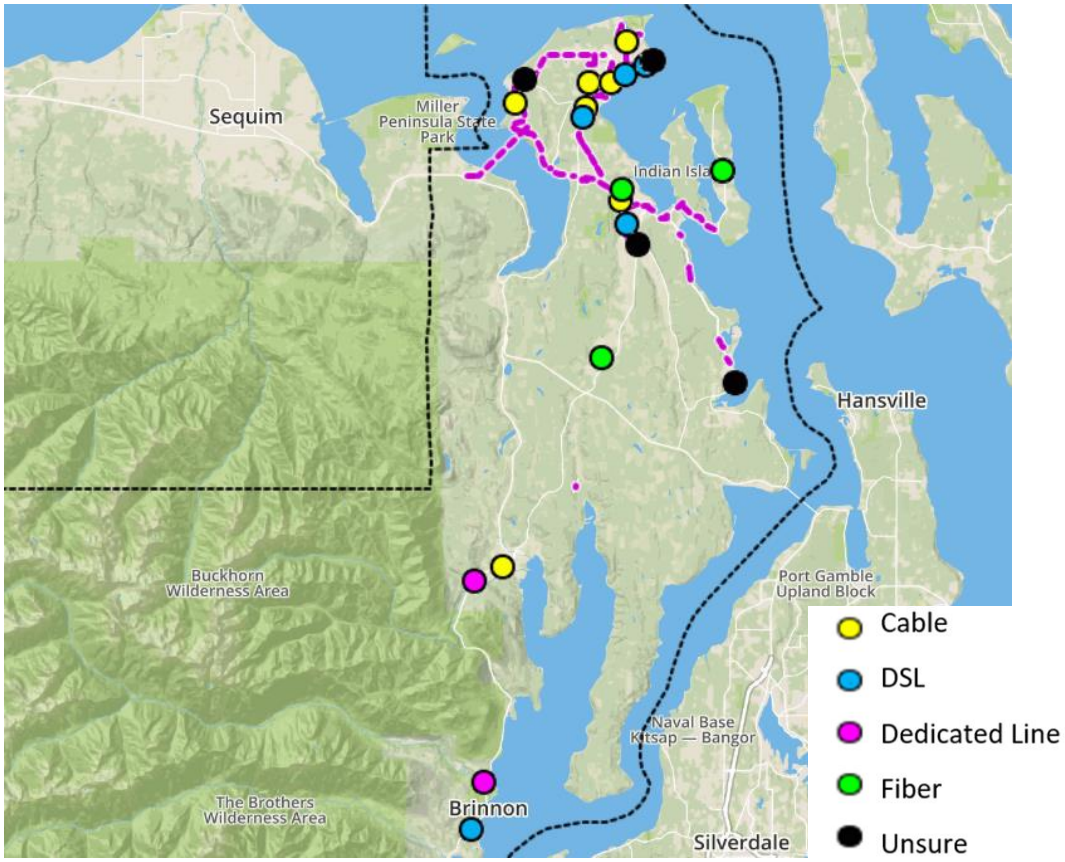


Figure 4-7. Business Surveys: Connection Type by Location



The figure above shows survey response locations by their connection types for businesses and organization. While cable, DSL, and dedicated line options appear to be available in various parts of JPUD's service area, fiber was identified as a connection type in only a narrow area in the central northeast.

A speed test was imbedded in the business survey to assess the performance of respondents' current broadband services. As is common, actual speeds were much less than contracted speeds.

Figure 4-8. Average Monthly Recurring Costs (MRC) and Connection Speeds

	Contracted Speed		Actual Speed		Monthly
	Down	Up	Down	Up	Recurring Costs
Responses	29	29	27	26	36
Max	10000	1000	252.9	165.32	$1,500.00
Median	20.00	6.00	5.80	2.82	$79.98
Mode	10.00	5.00	2.93	N/A	$75.00
Min	1.00	0.25	0.95	0.24	$25.00

At about $64 per month, DSL was the most economical connection but, as expected, was fairly slow in speed test results. Cable delivered faster speeds than DSL, but was more expensive at about $102 per month. Fiber had the fastest speed but also the highest cost by far. On average, respondents paid $75-80 per month for internet access.

Figure 4-9. Average Speeds and Monthly Recurring Costs of Internet Connection Types Compared.

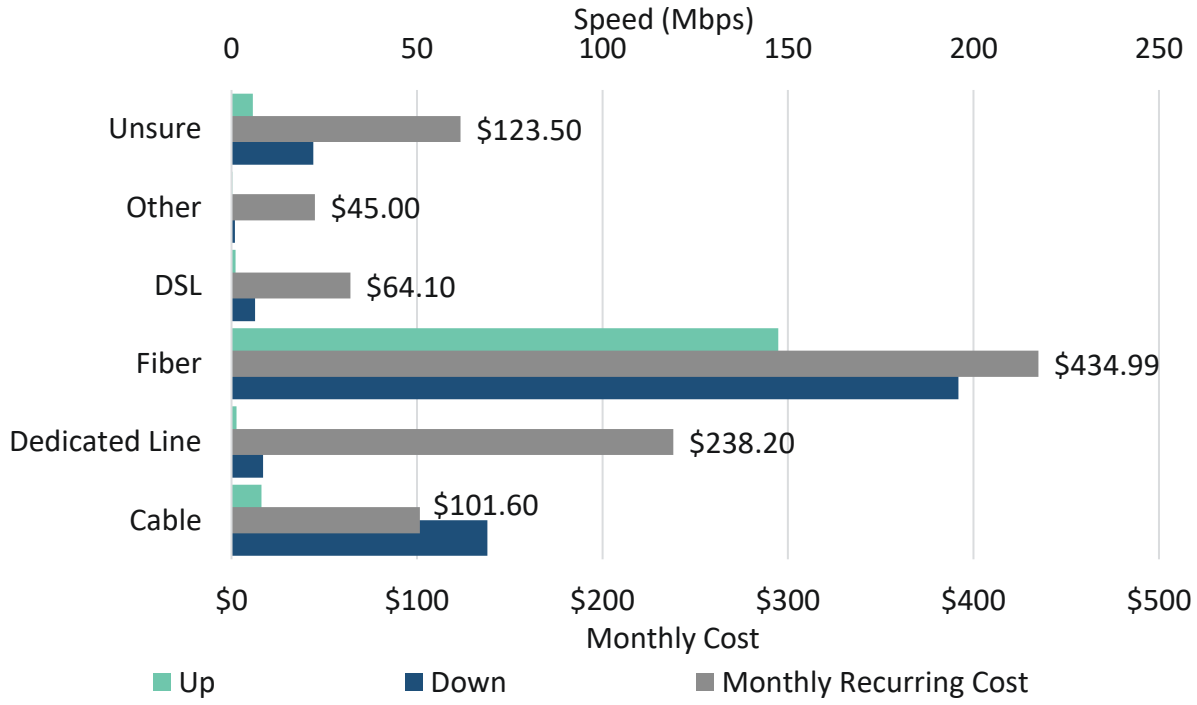
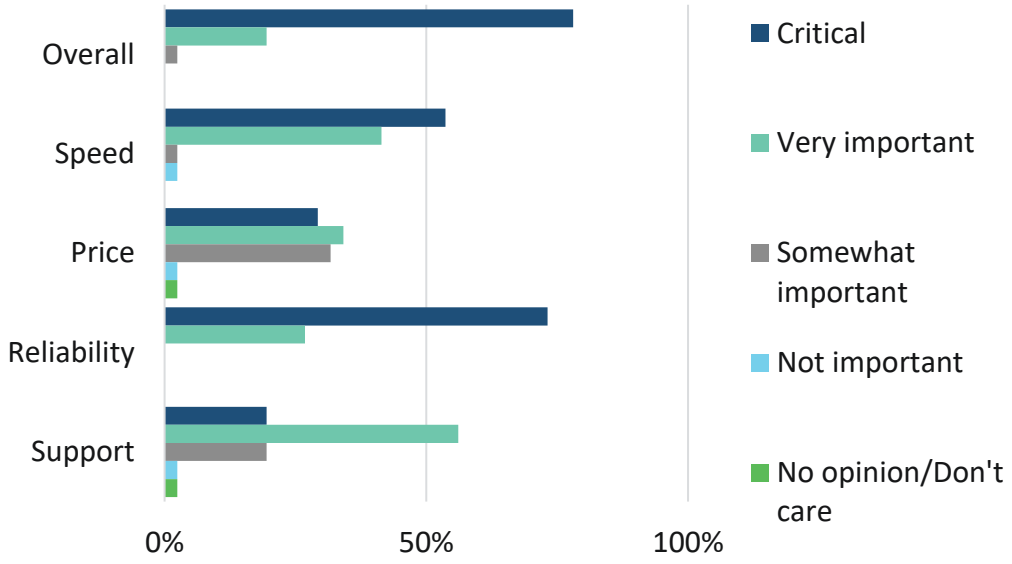


Figure 4-10. Overall Importance of the Internet for Businesses

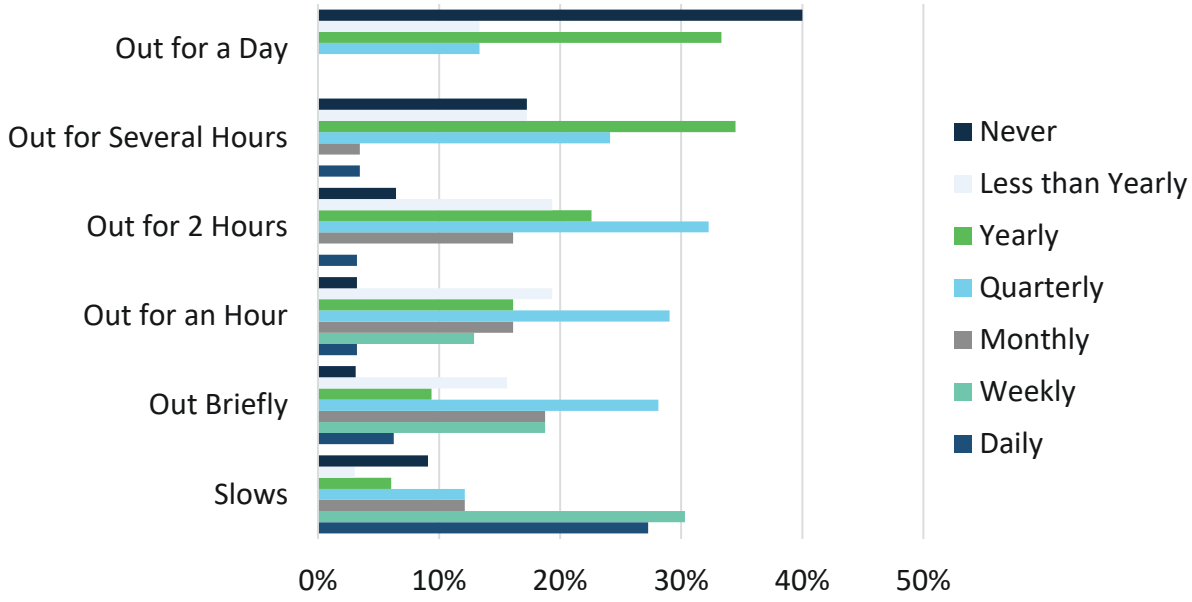


Overall, 78% of the respondents indicated that the internet was critical to their business, with another 20% saying it was very important. To understand what factors of service were most important to these businesses we asked respondents to rank the importance of several factors including Speed, Price, Reliability, and Support. All respondents indicated that Reliability was either critical (73%) or very important (27%). Speed also was considered either critical (54%) or very important (42%).

Respondents' sales & marketing activities were most reliant on internet, followed closely by administration or management, buying materials, and hiring employees.

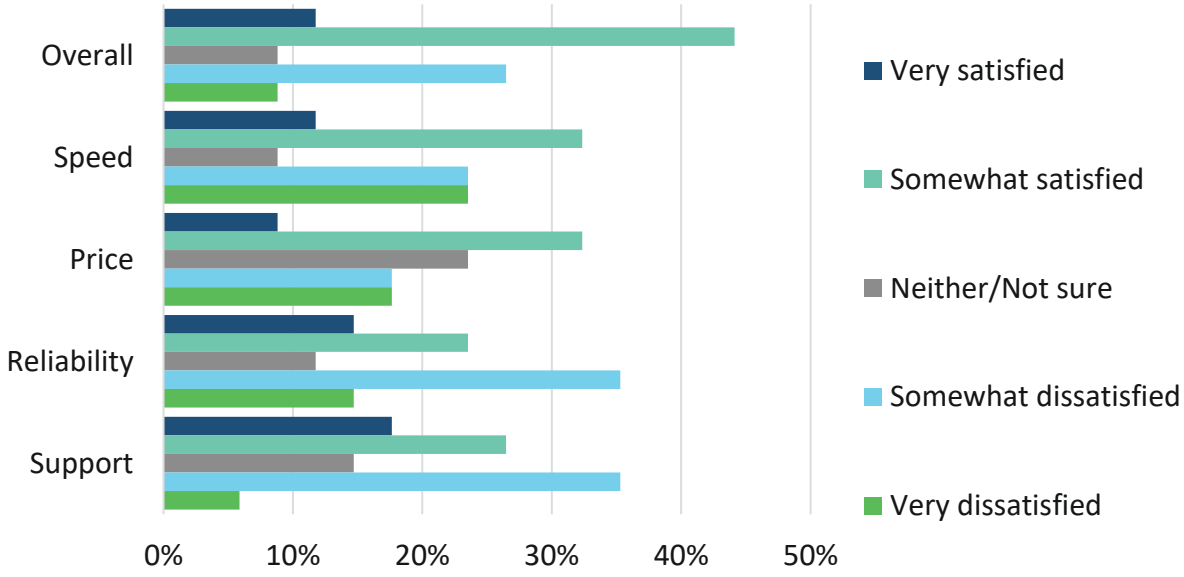
Of note, about 27% of respondents experienced daily slowing and 30% had weekly slowing. In addition, approximately 33% indicated that day-long outages occurred less than once a year. Substantial, hour-long or more outages were experienced by about a fifth of respondents, as indicated in the survey.

Figure 4-11. Percentage of Respondents Reporting Frequency of Performance Issues



Given the importance of the internet to the daily functions of these businesses, the frequency with which they are experiencing outages or slow-downs is a notable issue. To gain an understanding of these effects, we asked respondents to rank their satisfaction both overall and across four discrete indicators which included Speed, Price, Reliability, and Support. Results are shown in the figure below.

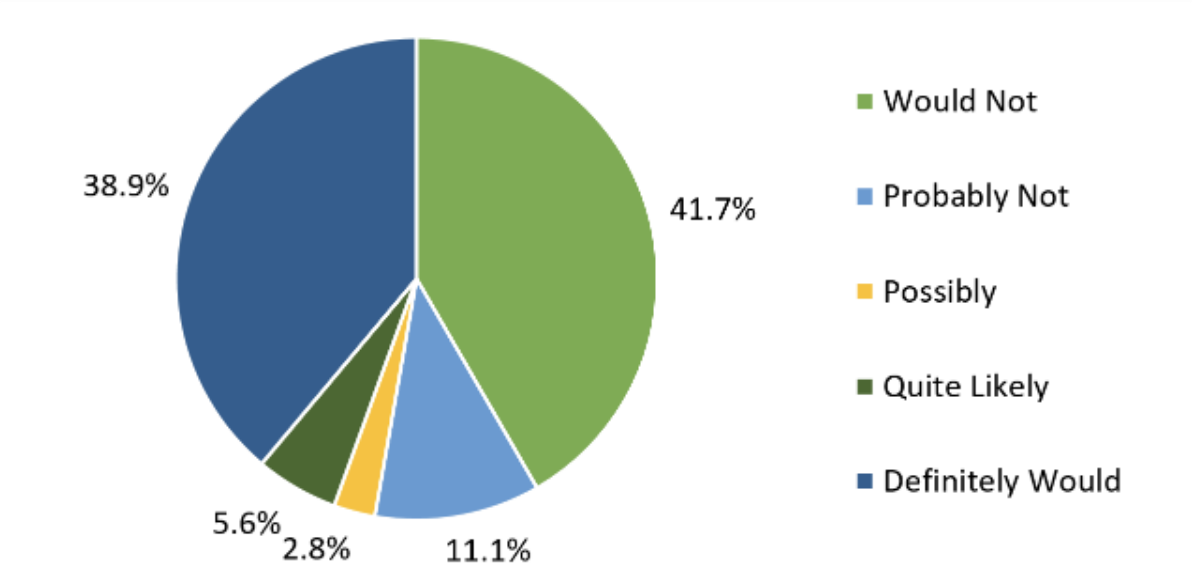
Figure 4-12. Percentage of Respondents by Level of Satisfaction with Various Aspects of Broadband Service



In regards to overall satisfaction, only 56% showed some level of satisfaction (either very or somewhat satisfied). Reliability and Support had the most dissatisfaction, with about 50% indicating they were not satisfied in those categories. Speed also showed a high level of dissatisfaction (47%). Combined, these results indicate there is an opportunity for a broadband provider (new or current) to offer a superior service and capture significant market share.

Respondents' willingness to pay for internet services increased with speed; conversely, they were generally less willing to pay for internet access from companies with poor customer service. Most (62%) were paying over $75 per month for internet service.

Figure 4-13. Business Respondents' Willingness to Move for Better, Cheaper, Faster Broadband



Respondents were almost equally divided on their likelihood of moving for better, cheaper, faster, internet service. Almost half (47%) indicated that it was at least possible. While almost 45% said they definitely or quite likely would move for broadband. This further supports the findings in the satisfaction ratings.

RESIDENTIAL BROADBAND ASSESSMENT SURVEY

The residential broadband assessment survey had strong participation with a total of 1,229 responding, of which 1,035 (84%) were complete and 194 (16%) were partially completed. Responses were spread throughout JPUD's service area, as shown on the map below.

Figure 4-14. Residential Survey Result Locations

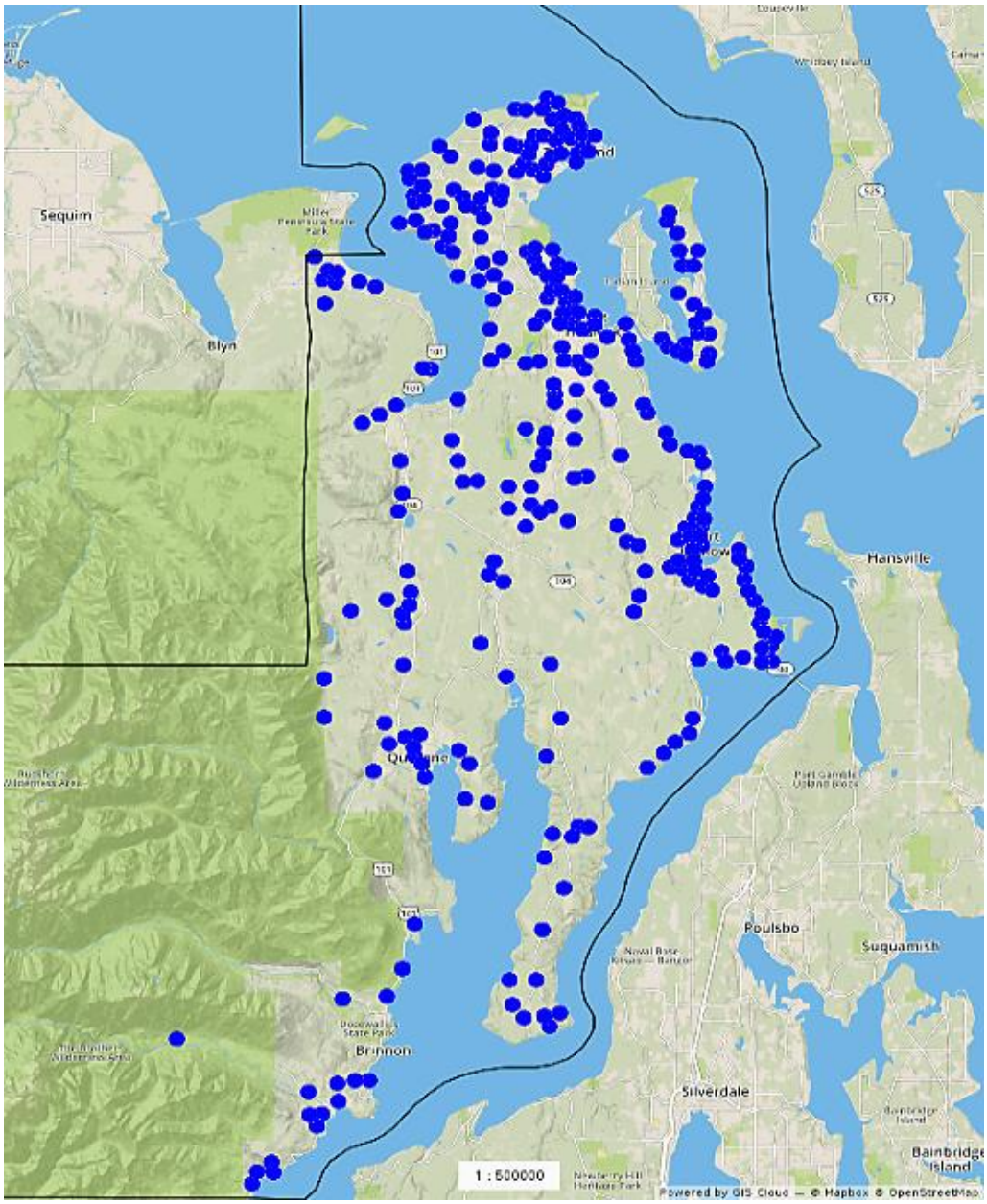
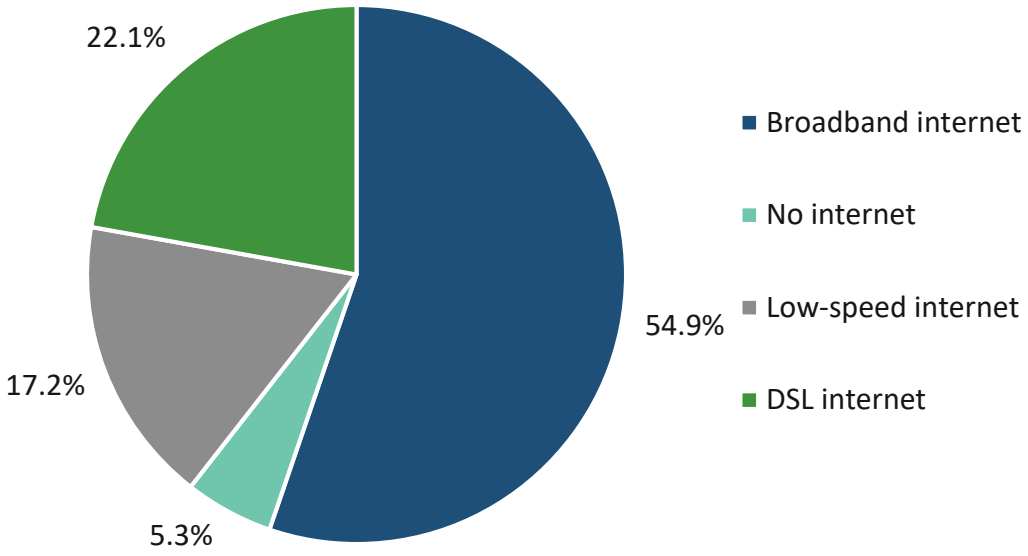


Figure 4-15. Residential Survey Responses by Completeness and Type of Internet Access

Responses	All	Broadband Internet	DSL Internet	Low-Speed Internet	No Internet
Total	1,229	675	271	211	65
	100.0%	54.9%	22.1%	17.2%	5.3%
Complete	1,035	572	232	173	58
	84.2%	55.3%	22.4%	16.7%	5.6%
Partial	194	103	39	38	7
	15.8%	53.1%	20.1%	19.6%	3.6%

Just over half of respondents (54.9%) indicated that they had broadband internet at their location. DSL and low speed connections were indicated in 22.1% and 17.2% of responses, respectively. 65 respondents (5.3%) indicated that their homes had no internet access at all.

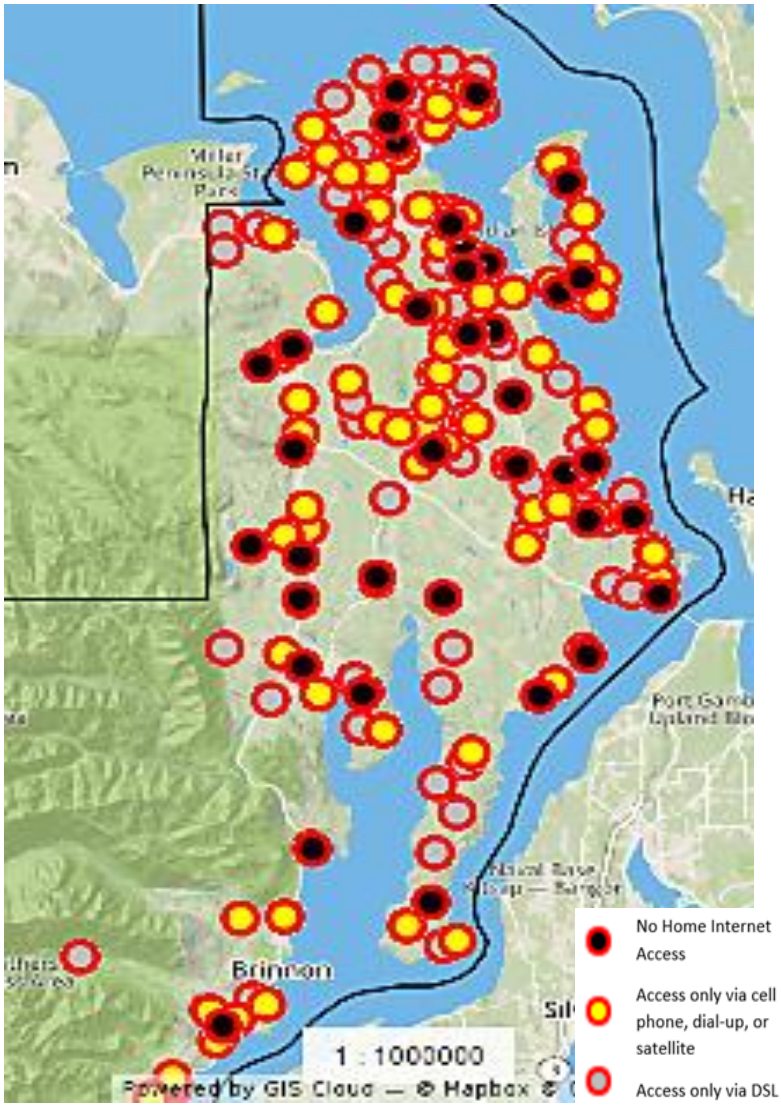
Figure 4-16. Percentage of Residential Responses with Internet Access



It should also be noted that respondent's own definition of broadband may differ, so some respondents may have identified that they had broadband in error. While the survey indicates broadband as being defined as 25/3Mbps, we should not assume that all respondents answered according to that definition.

The map below indicates the locations of survey respondents who had no internet access or access only via cell phone, dial-up, satellite, or DSL slow-speed connections.

Figure 4-17. Residential Responses with No Home Internet Access or Access Only by Slow Speed Connections



As in the business survey, the residential survey contains a speed test to capture actual broadband performance. On average, residential respondents paid $60 per month for internet access. As shown in the table below, actual speeds were much less than contracted speeds for residential customers.

Figure 4-18. Residential Broadband Internet Contracted and Actual Speed & Monthly Costs

	Contracted		Actual		Monthly Costs	
Speed	Down	Up	Down	Up	Total	Per Mbps
Count	749	696	897	896	1053	897
Max	2000.0	1000.0	672.8	672.9	$7,500.00	$3,824.58
Mean	91.5	49.1	30.6	5.7	$77.66	$15.97
Median	20.0	5.0	11.1	2.4	$60.00	$4.94
Mode	100.0	10.0	1.3	7.8	$50.00	$0.00
Min	0.1	0.0	0.2	0.1	$1.00	$0.11

The majority of residential customers/respondents (70%) had internet speeds under 25 Mbps, which is below the FCC's official definition/threshold for 'broadband service.' Many of those who did have speeds greater than 25/3Mbps, were located in more densely populated centers such as Port Townsend. The more rural parts of the community, as expected, suffered from slower speeds, less choice and greater expense.

Figure 4-19. Throughput Distribution for Residentail Responses

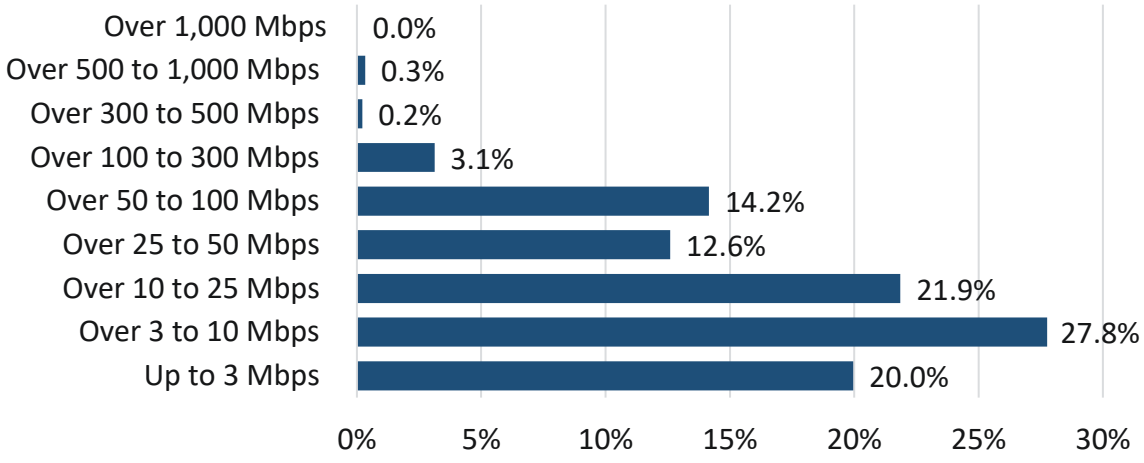
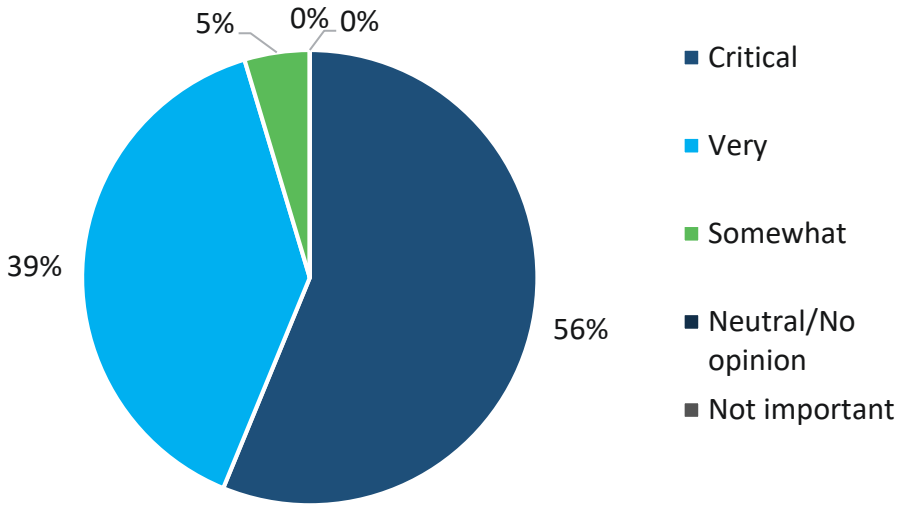
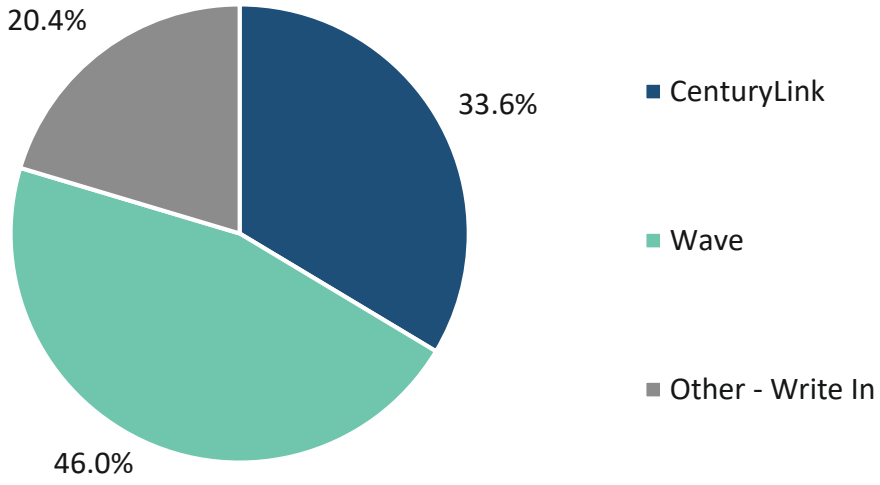


Figure 4-20. Importance of Internet Access for Residential Respondents



The vast majority (95%) of respondents indicated the importance of internet access was critical (56%) or very important (39%). This was also the case (as an essential service) regardless of whether someone had broadband, slow internet or no internet as shown below. Most respondents (95%) indicated that they felt internet is an essential service.

Figure 4-21. Residential Survey Results: What Company Provides You with Internet Service?

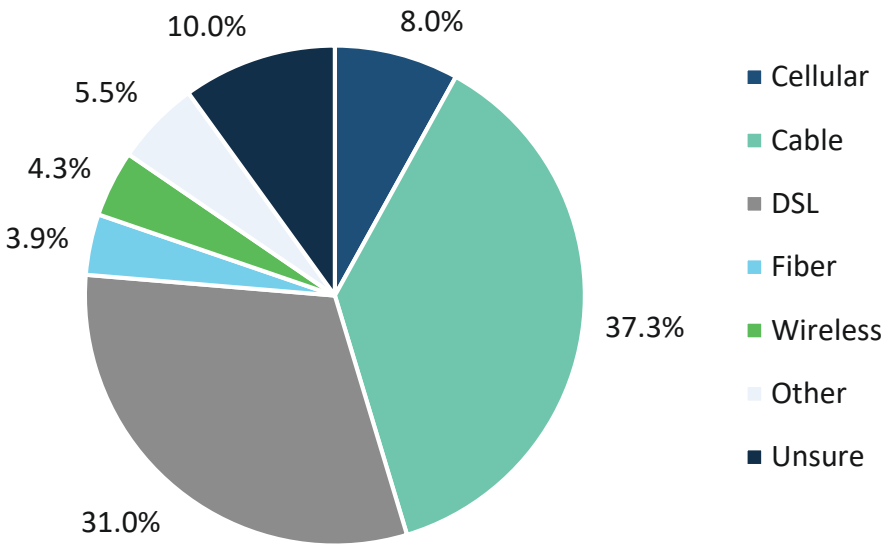


Competition for internet service is limited with Wave (46%) and Century Link (33.6%) accounting for more than 79% of market share for residential internet service. Other (write-in) providers are listed below.

Other providers (write in):

AT&T	Excede	North Olympic Data Center	Verizon
AWI	Google	Olympus	Viasat
Direct TV	Hughes Net	Olypen	Waypoint
Dish	Marrowstone Wireless	Sprint	Wildblue
Earthlink	Neighbor	T-Mobile	

Figure 4-22. Residential Survey Responses: Type of Internet Connections



Cable and DSL were the primary methods of connection of internet access at 37% and 31% respectively. Only 3.9% had a fiber connection.

The map on the following page provides an overview of respondents' connection types by location. Cable (yellow dots), DSL (blue dots), and cellular data (red dots) connections appear to be widespread. Fixed wireless connections (light blue) are more sparsely distributed, but appear sporadically in various parts of the service area. Fiber connections (green dots) primarily fall in the northern areas near Port Townsend and along the eastern coast near Port Ludlow.

Figure 4-23. Residential Survey Responses Mapped by Connection Type

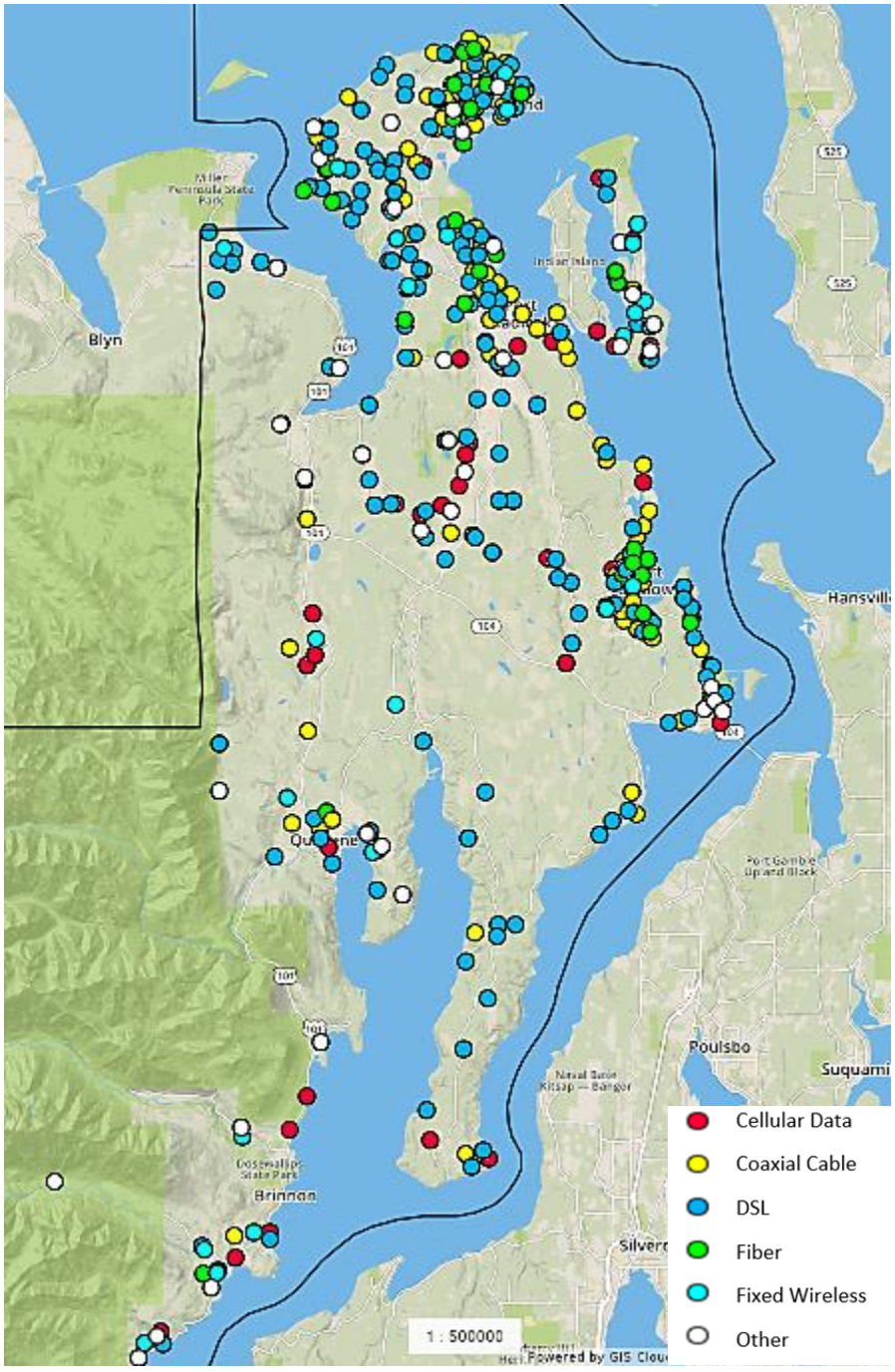
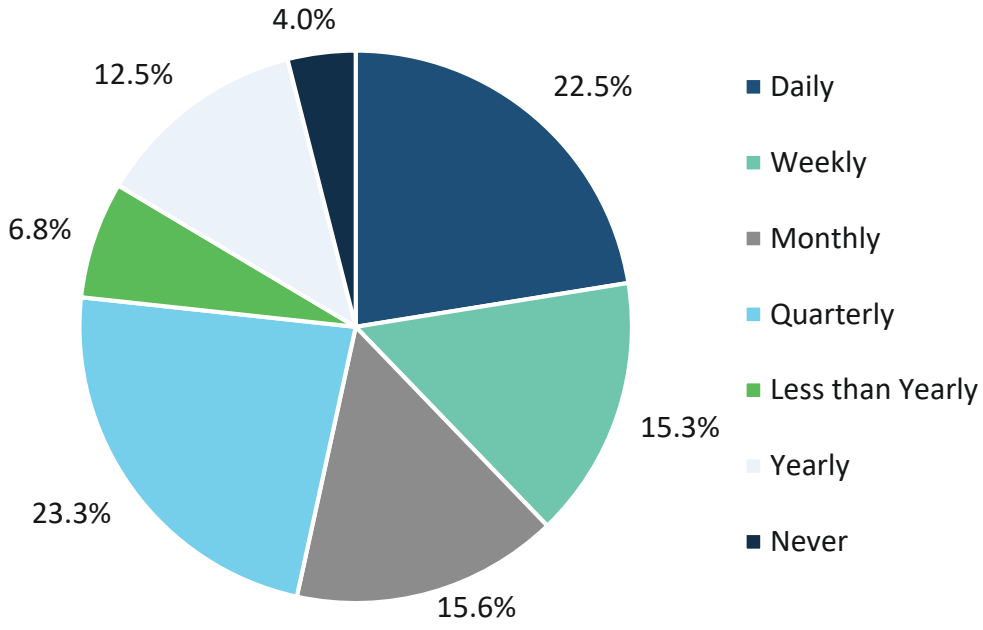
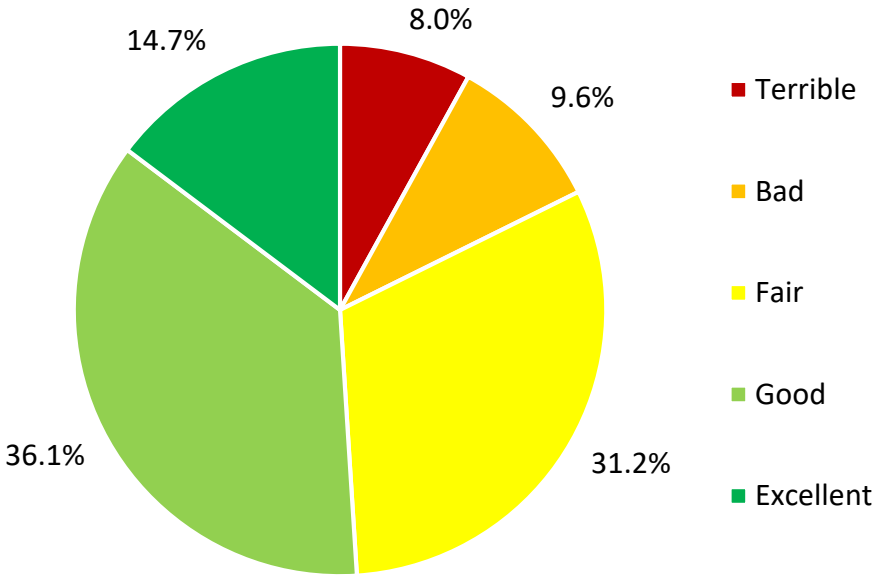


Figure 4-24. Residential Survey Responses: How Often Does Your Internet Service Go Out?



A significant amount of respondents indicated that their internet service would go out daily (22.5%), with an additional 15.3% saying it went out on weekly basis and another 15.6% indicating it went out at least once a month. These frequencies of service slow-downs our outages demonstrate relatively low levels of reliability.

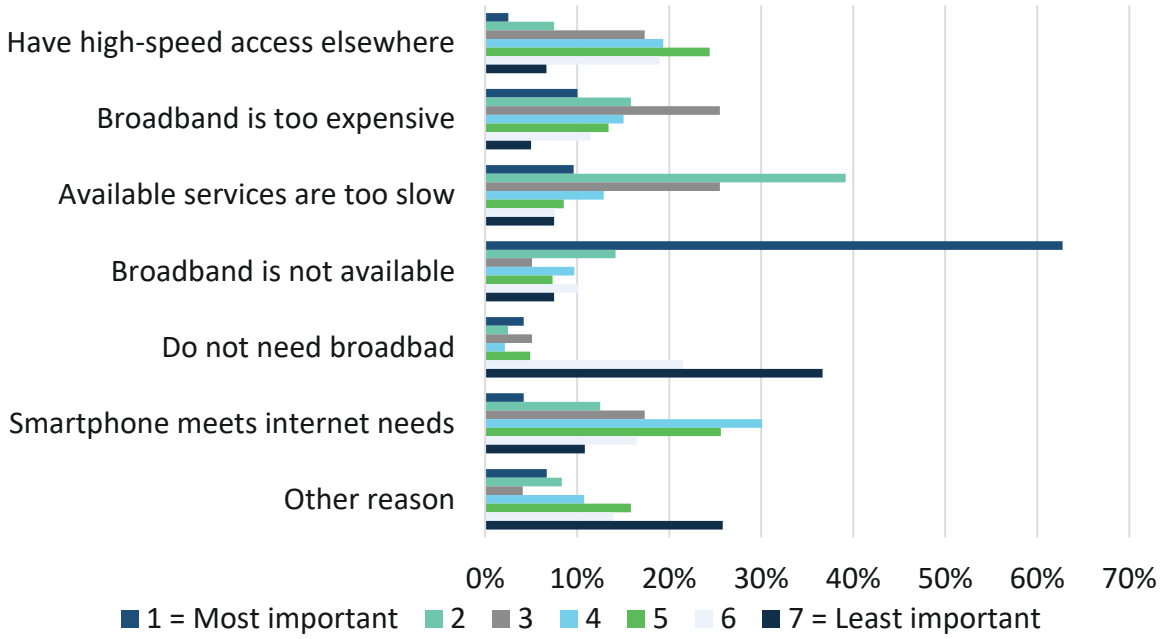
Figure 4-25. How Good is Your Internet Service Overall?



In line with other responses to survey questions, almost half (49%) said that their internet service was either terrible, bad or only fair. This indicates there is an opportunity for a (new) provider to capture significant market share with faster and more reliable internet service at a competitive price point.

It should also be noted that some include customer support experience, speeds, costs, downtime, etc. in determining overall satisfaction. Some find that the speeds are acceptable, but the customer service is unacceptable, while others find that customer service is generally good, but their service is unacceptable.

Figure 4-26. Residential Reasons for No Broadband, by Percentage Ranking



Of those that did not have broadband service, 63% indicated the most important reason was that it was not available at their location. Additionally, 40% said it was too slow.

CONCLUSIONS

Most cities in the US do have access to broadband and multiple broadband providers. This region however, as expected, has a much larger percentage of the population that does not have even access to "broadband" at any cost[6].

Even in locations where broadband is available within JPUD's service area, the available options are unreliable. Both businesses and residents experience outages or slow-downs in service relatively frequently, as compared to other communities. Overall, actual speeds are much lower than contracted speeds and, given the importance of high-speed internet as expressed by businesses and residents, a more robust option would likely be welcomed by the community.

> By US standards, the communities within the region are way behind in their broadband availability solutions.

[6] Most industry experts do not consider satellite broadband given all of its speed, data cap, latency and pricing concerns.

CHAPTER 5

Business Case Evaluation

JPUD FIBER UTILITY OPERATIONS STRUCTURE

Improving internal operations

The PUD has a history of working with NoaNet on joint builds and network management. After interviews with management and various stakeholders, it is apparent that JPUD needs a contract, complete with a list of expectations, roles and responsibilities, that would be applicable to any entity providing network management and sales services.

To attract a new network management partner, or to improve the working relationship with NoaNet, the PUD address its own organizational structure, and then identify relationships with those that can support it. The PUD should prepare itself for facilitating broadband offerings before establishing external relationships to avoid confusion. Each organization needs clearly defined roles and responsibilities that are executable and measurable.

To better understand how the PUD might prepare itself for offering broadband, the following information SWOT analysis has been developed based on Magellan's conversations with management, the community and other stakeholders. Some of the current weaknesses or shortcomings that keep more users from signing up with the PUD are addressed in the body of this report as recommendations about how to proceed and implement a robust broadband service offering.

SWOT ANALYSIS

These are not targeted at the electric utility, but the broadband efforts of JPUD.

Strengths

- Poles and Wires infrastructure expertise
- Strong community presence and familiarity
- Public Utility with an expectation of break-even
- Partnership with reputable network management company/partner will increase federal and state broadband grant opportunities
- Community generally supports the PUD's efforts to deliver broadband.
- County economic development representatives understand importance of broadband and are willing to help in any way the can

- All JPUD facilities already fiber connected, so the PUD has experience with fiber
- Significant fiber assets and other facilities can be leveraged to reduce the overall cost of delivering the service

Weaknesses

- Non-shared aid to construction requirement is barrier to adoption because of out-of-pocket costs are deemed too high for most. Competitors don't always require an upfront fee
- Marketing competitive products – JPUD is not pricing or offering a competitive product for today's market
- Lack of organization broadband focus (culture)
- Lack of direction/plan
- Lack of recognized ISPs
- Some poles are oversubscribed and has installed a lot of poles in cities.
- Has state franchise agreement and doesn't want franchise agreements with cities.
- Equipment availability with only 12 trucks between water and power.
- No pole inventory or database, no pole testing of 11,000+ utility and light poles.
- No conduit in GIS, but JPUD has empty conduit, no records.
- No GIS data on abandoned water mains or electric runs.
- Still relatively new to the electric business, so broadband could become a distraction if not managed properly
- NoaNet (current "partner") already serves profitable anchors, schools, etc. leaving JPUD with limited revenue expectations in this vertical

Opportunities

- Attract new ISPs by developing an understandable Plan with fair pricing and predictable outcomes.
- Improve utility service delivery and reduce costs by improving facilities, labor, and materials with technology.
- Improve utility service quality and response time with meaningful performance metrics.
    - Provide new value-added services to attract investment, foster community, and generate new revenue streams.

    - Generate place-based metrics to guide development, help citizens, and inform policy making.
- AMR/AMI is a good place to start for building out network expansion thus sharing the last mile costs with broadband
- Wave, CenturyLink and others are JPUD engaged in joint trench activities, thus making it more affordable for all.
- The County has joint pole agreements – JPUD leases their poles.
- Ports and PUD's can offer wholesale services.
- Grow participation for Dig Once throughout the County.

Threats

Threats that would prohibit JPUD from pursuing telecom, and other providers or forces that would challenge JPUD's success.

- Power Company vs Water Providers vs Telecom Provider – Organizational Structure
- Current financial obligations may hamper opportunities
- Small, rural market
- State level laws regulating Retail vs Wholesale could change
- Other regional provider competition
- State legislation not changing.
- Smart meters are a negative for the community
- LUD Model not acceptable to the community

Should JPUD decide to expand its broadband infrastructure, its service area would be positioned to become a highly connected community that will have assets and capabilities to be modern, forward thinking, and innovative.

JPUD POTENTIAL FIBER (REVENUE) OPPORTUNITIES

There are several different roles that JPUD can play by participating in the service area's broadband ecosystem. Each of these could be considered revenue opportunities, but as a public utility its value as an infrastructure provider could mean so much more "off the balance sheet."

Importantly, while Washington law does not currently provide an ideal retail revenue scenario when considering the provision of retail broadband services, there are many areas that JPUD can derive revenue and contribute to the growth of broadband service availability in its service area. Many of these items are not exclusive of each other,

meaning that JPUD could take on multiple roles as applicable or it could explore as standalone opportunities. Some of these roles are detailed below.

Conduit and Duct Owner

JPUD already builds and maintains aerial and underground utilities, along with other physical infrastructure in the public rights-of-way. Conduit is in many ways simply another form of such physical infrastructure, typically a two or four-inch diameter pipe that instead of carrying water, carries and protects fiber-optic and other cables. Conduit can be installed with and alongside any other underground facilities, so it minimizes construction disruptions in the future. Once conduit is in place, fiber-optic cable can later be installed inside the conduit relatively quickly and inexpensively with little to no ground disturbance.

Through proactive broadband-friendly policies that would be made in concert with local planning and codes jurisdictions, JPUD can work to ensure that any construction inside Jefferson County and the JPUD service area include conduit that becomes property of the utility or the local authority. Having a public conduit system can be advantageous for many reasons, one of which would be for historic preservation, allowing buildings to be updated with modern services without major site reconstruction. The utility can then lease space inside the conduit for a fee to generate revenue, or give away access to promote development. By installing conduit in areas targeted for redevelopment, JPUD can facilitate broadband and economic growth in those areas at a fraction of the cost to all parties involved.

Vertical Asset Owner

Vertical assets, including buildings, poles, and towers, are critical for all forms of wired and wireless communications. Antenna are essential for wireless services, and they need to go somewhere high. By placing vertical assets adjacent to ducts and fiber, and vice-versa, the utility can encourage development of next generation wireless services. Whether it is Wi-Fi in the parks, fixed wireless in industrial and commercial corridors, or mobile wireless for public safety, vertical assets are key. In some cases, vertical assets simply make wireless possible; in other cases, JPUD could exchange access to vertical assets for service discounts or it can charge providers a fee to attach and connect to the vertical assets.

Dark Fiber Provider

In a fiber-optic network, the owner of the fiber cable may not be actively using every individual strand of fiber. Those fibers that are in use are considered "lit," while those that are unused are considered "dark." This originates from the simple fact that in order for fiber optic strands to transmit data, electronics on both ends of the span of fiber must beam pulses of light to carry the data. In short, if the fiber is lit, then it can carry data.

Providing "dark fiber" to businesses in its service area, JPUD would own the infrastructure but would lease paired strands of dark fiber to an entity that would then light the fiber using their own networking equipment.

This would typically benefit organizations with multiple locations to interconnect across the local JPUD network. Local governments, schools, hospitals, financial institutions, information companies, manufacturers, and other organizations have a need for such capabilities. For instance, all banks could connect their branches and ATMs across the same network, or all the rural health clinics in the service area could be on their own strands of fiber, which would also offer the highest levels of security. ISP's may also be interested in leasing dark fiber that they will then provide lit services over.

Redundancy Provider

All large enterprises understand the importance of diverse routes to connect their local facilities with corporate facilities outside the region, both to maintain operations and to provide off-site disaster recovery. Therefore, a market strategy that will ensure continuity of the JPUD service area's industrial base and to offer redundancy for community anchors is to meet the network route diversity needs of its business community.

Starting first as a redundancy provider, over time the confidence of JPUD services can be solidified with businesses. Then, as redundancy customers fulfill contract obligations with their primary service provider, it is foreseeable that JPUD and its retail service provider partner would migrate into a role as the primary service provider. This would be a strategy to gain market share over time.

Business and Residential Value-Added Service Provider

While many public utilities across the country can provide full retail services to their homes and businesses, the State of Washington, for now, does not allow utilities to offer retail broadband services. Nothing says this law will always be in place, so in the future JPUD may be able to have a decision in the services that it provides. Therefore, decisions JPUD makes today must have an eye to the future possibility of becoming a broadband utility and should be careful with investments. This means that JPUD should be mindful of entering into long-term partnerships that could prohibit future freedoms and limit opportunities.

During this time of retail broadband prohibition, JPUD should explore the development of consumer services that do not involve the retail provision of broadband connectivity. With a physical connection to the homes and businesses of the service area, there could be an unlimited array of services possible through the fiber

connectivity. While not providing broadband access, JPUD can become a value-added information service provider, especially in the energy and utility sector.

While traditional retail services involve the "triple play" of internet access, television service and telephone service that JPUD is forbidden to offer, specialized data services can offer access to a particular managed service or source of data that can generate revenue for JPUD while providing a valued service.

As an example, JPUD and local partners could operate a public safety surveillance network, or a network of visitor information kiosks, or a public health information exchange, or an information portal for local nonprofits to collect and distribute information, such as water quality measurements along service area streams. With a wireless network in tourist areas, JPUD could offer a local tourism app to promote local businesses and visitor information.

Infrastructure for Retail Service Providers

Given current state regulations, one of the most likely scenarios for JPUD to increase the availability of broadband in its service area is to simply become an infrastructure provider for retail service providers. Telecommunications providers are generally happy to lease existing fibers to avoid upfront capital costs and reduce operating expenses.

JPUD fiber customers are required to aid-to-construction and spend significant amounts of money to build out JPUD's network infrastructure to their premises from the nearest JPUD network access point. This can often take several months, and then the business must subscribe to costly service under long-term contract arrangements. Placing the economic future of service area cities in the hands of broadband service providers can have a negative effect on business recruiting and expansion efforts. Most businesses and residents are reluctant or unable to fund such costly upfront fees and as such, such a model will inhibit the growth of broadband in the region. Using a Local Utility District (LUD) or utility company financing model will serve as a vehicle to increase subscriber numbers as it relives end-users of the potentially large upfront out-of-pocket expenses and lets them contribute monthly, via their broadband bill, to the cost of the construction.

By deploying fiber infrastructure and having it readily available for retail providers to offer the business community, JPUD gives its communities a distinct economic development advantage. And by taking on this infrastructure supporting role in the local broadband ecosystem, JPUD can continue its role as "poles and wires" experts in Jefferson County without getting directly into the business of broadband.

Open Access Model – Attracting ISP's

This model is often described as the Open Access Model (OAM). Nearly all utility providers in Washington State that offer broadband use an OAM paradigm as their vehicle for delivering broadband. Even in states that do not have restrictions on utility providers offering retail services, have elected to implement some form of an Open Access Model.

OAM's are facilitated by the utility company providing the network infrastructure including middle-mile and last-mile portions and then partnering with participating ISPs to provide the "retail" services over that infrastructure direct to the end user. The ISPs compete with their services, support and pricing they provide.

Conceptually, the end user can easily change ISPs if they find another solution fits them better. The utility provider becomes agnostic as to which ISP an end user chooses. Having end user choice means the ISP's provide better services given that competition is always just a click away.

Not all OAM's are successful. Many entities assume that if they build the network, ISPs will come, only to find out it takes a bit more effort than that. JPUD has had this experience to date and is looking to revamp their service model and set it up for success.

A few key points that JPUD should follow when establishing their OAM model:

1. *Attract ISP's.* JPUD must cultivate and maintain a strong list of ISPs to actively sell and support broadband services
2. JPUD or the end user, **must** own the last mile infrastructure. If the ISP owns it, the customer will be forever beholden to that ISP.
3. Remove expensive barriers-to-entry for the end user by implementing the LUD or utility company financed model to help relieve the burden of large out-of-pocket expenses.
4. JPUD must take an active, not passive, role in the deployment, design, and management of the network including prioritizing where it gets built and also the sales and marketing process, by working closely with the ISP community as active partners.

Broadband providers that fail to adhere to the items listed above often struggle to create and maintain a reliable and profitable OAM business model. Having a long list of ISPs does not guarantee success. However, having only one or two active ISPs is also a contributor of failed OAM models.

INDUSTRY ROLE MODELS

A variety of models for providing broadband services exist in the areas surrounding Jefferson County. Despite the statewide ban on utilities providing service directly to end users, many utilities have found ways to use their existing infrastructure to support more widespread broadband adoption in their communities. Below is an overview of several of these industry role models for JPUD's consideration.

Mason PUD 3 Broadband Model

Mason PUD 3 is an electric utility company serving roughly 34,000 entities, many of which are in rural areas of Washington State. Capitalizing on the PUD's need for connectivity and fiber to manage the electric utility, it is also working to fill the broadband gap left by incumbent telecom providers who do not see a business case for providing services to rural areas. For years, the residents and businesses in Mason PUD's service area sought broadband offerings from the local providers, but to no avail. Either these unserved or underserved areas were deemed too remote, making it cost prohibitive, or the carriers simply had no competitive reasons to improve service. Whatever the causes, the results were the same – no reasonable broadband service to many parts of their community.

Today the PUD 3 operates a wholesale fiber-optic telecommunications network, which supports the operation of its electric distribution services. This network is then extended to certain residential "*fiberhoods*" to make the excess capacity available for broadband use. The PUD also offers broadband to certain commercial entities as well.

Local telecommunications businesses have partnered with PUD 3 to resell broadband, telephone service, and basic and high-definition television service in keeping with the Washington State ban on PUDs providing retail broadband services. This model is often referred to as an Open Access Network.

The PUD's fiber-optic network complements existing telecommunications services. It provides Mason County with fast and reliable business network connections. The PUD telecommunications system also has locations where businesses can house their internet and network services in a reliable and secure collation facility.

As a wholesale-only network, the PUD does not provide services such as TV, phone or customer service to the end users. This is the responsibility of the several Internet Service Providers (ISPs) that buy wholesale internet access from Mason PUD and resell it to the end users.

Mason PUD stresses that their model only works if the fiber is made available as a complement to their plans for fiber-based SCADA network upgrades to manage their

electrical assets. To date, models have not been planned to offer broadband without an electrical network management component.

How It Works

When designing where to build their fiber assets to support their electrical system, the PUD also looks for opportunities for delivering broadband that can be cost-effectively supported for certain residential and business communities. The PUD works to identify clusters of unserved homes called "*fiberhoods*" that can band together and commit to ordering fiber/broadband from the PUD. The PUD facilitates a website and phone system alerting the community that they have been identified as a potential candidate for broadband and then requires these potential end users to pre-enroll for service or, at minimum, to make a commitment to take services once they are available. If 75% of the identified community agrees to purchase service, then that community is put on the construction schedule to get fiber.

Those within these identified *fiberhoods* are then encouraged to contact their neighbors to encourage them to subscribe to services, increasing their chances of a successful outcome.

Currently, the PUD only targets communities that are unserved or underserved, not areas where incumbents already provide service, although this strategy may change in the future.

Costs

Some costs in the Mason PUD model are assumed by the PUD, while other costs may be passed onto the homeowner or business. The PUD will ultimately own all fiber going from the street or pole (last mile), to the demarcation point on the home or business. This model allows an end user to easily change ISP's if they are not happy with the service and in keeping with the open access model as described above.

Other models require the ISP to carry the cost and ultimate ownership of the last mile infrastructure, which locks a customer into that ISP long-term. While this model reduces the cost to the PUD, it is ultimately not in the best interest of the consumer. There are also some models in which the consumer pays a full upfront aid-to-construction fee, but this may be a barrier and hardship for many customers. While this model does allow the customer to ultimately own the last mile, upfront fees may be constraints that many cannot afford.

Mason PUD 3 pays for all middle-mile assets to reach the community. This is generally paid for by the electric utility as it upgrades its network to support its electrical communications needs. The PUD then provides the end user with two options, overhead or underground, based on the type of last mile infrastructure required. If the end user has an overhead line, the PUD includes the costs of up to 200 feet of the last

mile in the monthly construction fee, which is added to every bill (more on this below). However, if the user needs the last mile to be underground, the end user is responsible for covering those costs. The PUD will work with the end user to determine the best route and ultimate costs associated with either type of build.

The PUD has determined that all subscribers in this model need to contribute $3,600 towards the cost of construction for their new service, regardless of overhead or underground. However, this $3,600 need not require upfront fees and can be added to the monthly broadband bill. This fee is $25.00 per month for 12 years, which most end users can afford. The end user also has the option of paying the construction fee in advance for tax purposes or convenience.

Grants – Funding

Mason PUD 3 has applied for and received some state and federal grants to help augment the cost of building the network.

Broadband Rates

Understanding how fiber optic networks function, the PUD has decided to keep things simple for the end user. They only offer one service level or speed – 1Gbps (1,000Mbps). It does not cost the PUD any more to deliver 1Gbps then to deliver 100Mbps, given the costs are nearly all in the installation of the physical plant. Once the network is there, 1Gbps service can be provided just as cost-effectively as 100Mbps or less.

The average end user monthly rate for 1Gbps service is around $85 per month, which includes the $25 per month construction fee. Once the network is built, ISPs compete for end users by highlighting customer support, TV, phone, and other services they can offer. $85 per month for 1Gbps is very reasonable and Mason PUD 3 should be complimented on their efforts to keep rates low. The PUD also supports, in conjunction with the participating ISPs, a low-income broadband subsidy totaling roughly $20-$40 per month.

The PUD does not offer dark fiber or use fixed wireless as a last mile technology.

Network Management – Staffing

Mason PUD 3 manages the day-to-day operations of their broadband network. After hours, NoaNet manages the network for them. Mason PUD 3 has approximately 11-12 full time employees (FTE) that handle fiber-related network activities including the management of their SCADA and electric utility operations. This staff is also responsible for some customer support (to the ISPs), network planning, engineering, middle-mile and last-mile assistance/construction, and billing.

Mason PUD 3 has been building and managing their fiber-based network for many years and has a whole division within the company dedicated to supporting it. The PUD also owns the Optical Network Terminal (ONT), which aids in their ability to properly manage the network.

The Pros/Cons

The Mason PUD 3 model has many attractive elements such as:

- 1Gbps service is very robust
- Fiber networks are the Cadillac of networks now and into the future (future proof)
- No upfront fees (generally) for the end user, which increases take rate
- Same construction costs applied to all end users
- An active ISP network ensuring competition and good customer support
- Capitalizing on existing electric utility assets reduces overall costs
- Able to serve customers that might not otherwise be able to get broadband
- Robust fiber broadband is an economic engine for the region
- Grants have helped to offset some of the costs
- End user pricing for 1Gbps seems reasonable
- Low income program is admirable

As with every business model, there are some items that are more concerning, such as:

- Profitability is difficult to determine given the shared electric utility component. It is unclear if this model is profitable and what Return On Investment (ROI) is seen.
- Not everyone in the service territory can get fiber; only those in *fiberhoods* that the PUD can reasonably afford to connect will get service, leaving some unserved. Others are in served areas and are offered service by current providers.
- Long lead times for construction. The network is a slow build over time as the electric utility expands its network assets as needed. As such, it has been reported that several *fiberhoods* are waiting a long time to get service
- For some, $85 per month is too high. Striking a balance is always difficult. Other alternatives may be available to them such as satellite or DSL.

Conclusion – Mason PUD 3

In total, the Mason PUD 3 model is attractive and aspects of it could be applied to JPUD. JPUD is looking at providing service to their predominantly unserved residential population, just like Mason PUD 3. Also, the two entities are both electrical utilities with the need for fiber to manage their electrical networks which could then be made available to end users.

There are some potential differences that need to be recognized between the two communities. Mason PUD 3 has been offering broadband for a long time and seems to have it running smoothly (albeit at unknown profitability; at this point, speculation only). JPUD is relatively new to the broadband business and it will take some time, with whatever model they adopt, to get up to speed.

JPUD's serving territory may be a bit different both in terms of geography and population. JPUD may not have the dense identifiable *fiberhood* type of locations that Mason PUD 3 does. Survey results indicate that many of the homes in JPUD territory are not clustered together as definitively as some in MPUD's territory. This may make identifying fiberhoods more difficult.

JPUD will need a business model that can attract the confidence of existing ISPs to create an ecosystem of solutions that end users will need. Some Open Access Network models have not been very successful in other parts of the US and end up with one or two active ISPs that dominate the area, resulting in the absence of the competitive environment envisioned in an OAN model.

Kitsap PUD Broadband Model

Kitsap PUD is a water-only utility whose territory is directly adjacent to JPUD's service territory. Kitsap PUD has been operating a high-high-speed open-access fiber-optic broadband network in Kitsap County for over 15 years. Almost all of the county's schools, libraries, government offices, first responder buildings, and major medical facilities have been connected to this fiber-optic network. This has allowed these agencies to keep pace with the modern world: hospitals transmit data and imagery, schools stream content and instruction, and first responders coordinate emergency response plans. Since 2015, the PUD has been working to deliver fiber-based broadband to the residential market. This is a community owned network and due to citizens' requests, Kitsap PUD is now offering fiber-based broadband to the residential community.

Kitsap's serving territory is much like JPUD and Mason PUD's territory in terms the remoteness of some of the points they serve. Being a water only utility only has presented some unique challenges for making excess internal capacity available to the community as a whole. They have been able to use some joint trench and dig once paradigms for putting fiber and conduit assets in the ground. Currently, the PUD has over 200 miles of fiber available, paid for by a small tax and through federal funds. The utility indicates that they have not used any water utility funds to pay for the fiber that will be available to the end user.

How It Works

Kitsap PUD solicits requests from the community about their desire, need, and willingness to pay for broadband, should it become available. The PUD has published their fiber network layout and their plans for future expansion of that network online. The interested end users then submit their willingness to get fiber-based broadband to their homes. Once enough users in a specific region have expressed that interest, the engineering team works to determine the last mile costs to service all the homes in close proximity to the where the interest lies.

End users are responsible for covering the averaged engineered cost for the network drop. This cost may be anywhere from $2,200 per sub, to over $12,000, depending on distance and effort required. If enough people agree to the service, construction will be scheduled.

The PUD uses an Open Access Network paradigm in that they do not offer retail services to the end user but work through a list of approved ISPs. The PUD or end user owns the last mile and can switch ISPs easily if so desired. This model creates competition and price controls through choice. Most PUDs in the State of Washington are prohibited from offering retail services for broadband, but Kitsap PUD has been granted a waiver from that provision allowing them to sell direct to the end user; however, to date, the PUD has refrained from this option and only offers service through ISPs. With retail services comes marketing, customer support, inventory, and sales requirements that the current PUD is not prepared to provide at this time.

Once a community (or the equivalent of a *fiberhood*) is identified, the PUD presents the opportunity to its Commissioners, who will in turn designate the area as a Local Utility District (LUD), which qualifies the community to get special financing to help cover the last mile costs. LUDs are used in the State of Washington much like Local Infrastructure Districts (LIDs) such as are used in Ammon Idaho City Broadband and function much the same as LIDs.

Local Utility District Models

To help pay for the last mile costs of getting broadband to the end users, the PUD designates each community as an LUD, which qualifies them for special financing terms with some local credit unions with terms of up to 20 years paid monthly. On a $5,000 cost, this equates to about $20 per month.

The credit union places a special lien on the homes in the LUD, which guarantees repayment and allows the credit union to help finance the construction costs. They also understand that this investment increases the property value of the home, so there seems to be no downside. Many end users are reported to pay off these liens via refinance or through direct payoffs prior to the maturity date of the loan. Another

benefit is that these lending institutions are generally local community credit unions so the money stays “local”.

In the LUD model, the end user does not have to come up with any money out-of-pocket and the PUD gets its funds to cover construction expenses (aside from the engineering) upfront.

Not all users are required to take the service within the community. All users have an option to opt-out, but the PUD needs a minimum number of pre-subscriptions before it will agree to provide the service.

Over the years, the PUD has perfected the LUD model making it a relatively straightforward and simple process to facilitate.

Grants

The PUD is always looking for grant opportunities to help reduce the cost of deployment or to improve the reach and availability of the services they offer. They have used many grants to build their existing network.

Services Offered

The PUD has elected to offer two speed packages through the ISPs: a 100Mbps and a 1Gbps option. These ISPs charge roughly the same price to the end user of about ~$60 per month for 100Mbps and ~$85-$90 per month for 1Gbps service. Many also offer TV, voice, and other features, which differentiates them from each other. End users are also responsible for the $20 per month ($5,000 example) last mile construction fee. That puts 1Gbps broadband at about $100 per month.

The PUD offers an active Ethernet network and provides symmetrical (same up and down speeds) service.

Network Management

Kitsap PUD is an investor/owner of NoaNet, a statewide middle mile network. The PUD contracts with NoaNet for network management. All network construction is contracted.

Sales/marketing is done jointly between the ISPs and the PUD. The PUD facilitates collecting data and user feedback on potential areas of interest, engineers the last mile solution and associated costs, assigns the LUD status as appropriate, and then helps the end user understand their options for financing the last mile. A lot of coordination is associated with getting to this point, long before an ISP is selected by the end user.

Kitsap has a staff of roughly 4-5 FTE working on their broadband network and facilitating the services.

Pros/Cons

The Kitsap PUD model has many attractive elements such as:

- 1Gbps service is very robust
- Fiber networks are the Cadillac of networks now and into the future (future proof)
- No upfront fees (generally) for the end user, which increases take rate
- An active ISP network ensuring competition and good customer support
- Capitalizing on existing fiber utility assets reduces overall costs
- Able to serve customers that might not otherwise be able to get broadband
- Robust fiber broadband is an economic engine for the region
- Grants have helped to offset some of the costs
- End user pricing for 1Gbps is reasonable
- LUD model is refined and well understood

As with every business model, there are some items that are more concerning, such as:

- Profitability is difficult to determine given the shared water utility component. It is unclear if this model is profitable or Return On Investment (ROI) is seen.
- Not everyone in their service territory can get fiber; only those in fiberhoods that the PUD can reasonably afford to connect will get service, leaving some unserved. Other are in served areas and are offered service by current providers.
- Potential long lead times for construction.
- The LUD model can be cumbersome to implement and a large end user educational piece is required.

Conclusion – Kitsap PUD

Kitsap PUD's business model it intended to provide broadband for many in their service territory that have not been provided service by the incumbent providers. Their use of Local Utility Districts and associated last mile financing options to help pay the cost of construction is a useful tool for attracting new subscribers and making broadband available to them at little to no upfront costs. Any costs expended by the end user are generally made up in increase value of their property.

Kitsap is building a network based on fiber technology, which has the longest lifespan expectations of any wired solution, ensuring longevity of assets over time.

While there will be some homes that do not ultimately qualify given their extreme remoteness (and resultant costs), many communities that would otherwise not have an option with existing solutions have another option to consider. It does take time to

get consensus from a community, designate them as an LUD, schedule financing and construction, which may discourage some.

Open Access Models can be successful, and some are. However, it has been Magellan's experience that constant attention to the various ISPs' concerns needs to be a priority for the PUD to keep the ISPs engaged in the model. Open Access Models tend to have only one or two actively participating ISPs for a given region, thus limiting some of the OAM's promises.

Clallam PUD Broadband Model

Clallam PUD is a multi-discipline non-profit utility providing electricity, water, wastewater and broadband. They are located directly to the west of Jefferson County.

Clallam PUD has roughly 20 miles of their own fiber and capitalizes on NoaNet and other provider networks to reach their target areas. Most of the fiber in use today supports the PUD's smart grid/SCADA operations for both power and water. Excess fiber capacity is made available in certain areas using some local ISPs. As with most PUDs in Washington, they are precluded from offering retail services, which they indicate would not be their preference anyway.

Clallam PUD does not target residential communities; however, some ISPs have made their services available to the residential market. Clallam PUD is a wholesale fiber backbone provider that sells to ISPs, which in turn are free to offer services to any entity they choose. These ISPs predominantly offer service to commercial and business sites located within a workable distance of existing handholds and fiber.

Clallam PUD does not have an LUD or residential financing program like other PUDs. If an ISP is targeting a specific commercial property, the PUD will provide a cost for last-mile construction that will be paid in advance. How the ISP finances that is up to them; the PUD does not have a financing option available.

The PUD will provide whatever wholesale services the ISP requests. The last mile infrastructure belongs to the end user or the ISP, not the PUD. Some might call it a modified Open Access Model.

Network Management

Clallam PUD does most of their own network monitoring and management internally. For after hours, they also contract with NoaNet. Clallam PUD has a staff of roughly 2 people to help manage and maintain their fiber assets for both broadband usage and for their own internal network needs. They limit sales and marketing efforts to promote broadband and rely on mostly the ISP to provide this function.

Pros/Cons

The Clallam PUD model has some attractive elements such as:

- Service is based on fiber and is very robust
- Fiber networks are the Cadillac of networks now and into the future (future proof)
- Business offering only, reducing capital outlay and complexity
- An active ISP network ensuring competitiveness and good customer support
- Capitalizing on existing fiber utility assets reduces overall costs
- ISPs do a lot of the sales and marketing
- Overall headcount is minimal to support the network
- No capital outlay for last mile construction

As with every business model, there are some items that are more concerning, such as:

- Not everyone in the service territory can get fiber; only those near existing fiber and willing to pay last mile charges will be served
- Potential for only a few active ISPs
- Aid-to-construction cost may be prohibitive for some potential customers
- Potential long lead times for construction
- No targeted residential offering

Conclusion – Clallam PUD

Clallam PUD is quite a different model from Mason PUD 3 and Kitsap PUD in that they do not target a residential consumer and they do require some potentially costly last mile construction funds from the end users, thereby limiting access to some.

The model has limited overhead, and limited financial risk and they are making excess capacity available to those that are within an affordable distance from their existing assets, thereby creating more choice in broadband solutions for the community.

Port of Skagit and Skagit PUD Broadband

The Port districts in the State of Washington play unique roles compared to port authorities in some other states when it comes to broadband and economic development. Magellan has worked with or talked with several different port authorities in Washington State and many have taken steps towards providing broadband for their communities. Some have gone so far as to deliver and facilitate broadband down to the residential user (Port of Whitman), while others have been looking at middle-mile fiber availability to connect their ports with the potential to make excess capacity available to consumers. Others work with their

local communities on economic development and recognize broadband as an increasingly important ingredient.

The ports of Washington State have similar broadband authority to what the PUD's have. They can build and operate wholesale broadband networks. Ports in the State vary in the types of facilities they govern or manage. Some have sea ports, drayage, rail lines, marinas and airports, which others may only have airports and some facilities to manage. Many are looking to increase economic development activities in their regions to keep and grow their economic base. Broadband is playing an increasing role in their strategy as it has been recognized as an essential utility just like water, sewer and power.

The Port of Skagit, near Anacortes, has teamed up with Skagit PUD, a water utility provider, to deliver a middle-mile wholesale broadband network based on joint builds between the port and the utility which make excess capability available from the utility's fiber network. These two entities are also supported by Skagit County, the City of Burlington, the City of Mount Vernon and the Economic Development Alliance of Skagit County, to define and facilitate broadband. Each brings some of their resources to the table to make the broadband plan viable.

Their broadband plan is to build and operate a wholesale open access-based network that ISP's can utilize to deliver broadband services to the community. With a collection of assets from each of the organizations mentioned, the intention is to coordinate each "island" of network assets into a larger, better managed network covering additional territory and more consumers. They want to meld dissimilar networks into one cohesive network that can serve the needs of the rural communities, businesses, and anchor institutions. There are also several cities within the service territory doing their own city broadband buildouts, such as the City of Anacortes. This network will connect them to a larger system and take a regional approach to broadband.

Funding for this project has been done through grants provided by Washington State's Community Economic Revitalization Board (CERB) Program. The network is also being built using Dig Once, Joint Trench and opportunistic build strategies that provide reduced build costs over time. At the same time, the network is joining existing network assets to build a larger enhanced network utilizing and capitalizing on excess capacity.

The Ports, working in coordination with the PUD, can collectively provide an opportunity for better broadband for the regions they serve. Both entities have an interest in serving the community and making it a more attractive place to work, play, and live. The Port of Skagit and Skagit PUD model is just one example of collaboration between entities that share a common goal.

Orca's Power and Light Cooperative (OPALCO) Broadband

OPALCO provides electrical service to roughly 12,000 members living and working in the San Juan Islands, not far from JPUD. Much of their terrain and service issues are not unlike those that JPUD experiences in that many of their members and users are rural and hard to reach with limited traditional industry to help carry the costs of building and maintaining service.

OPALCO is a cooperative, not a PUD. As such, they are afforded and have taken the option to provide retail broadband services directly to the end user. All other aspects of their business plan and associated challenges are comparable to what JPUD is experiencing and will need to address.

OPALCO spent roughly three years or more working on a suitable broadband business model for their community. Their current model did not happen overnight; a lot of thought, engineering, and discussions went into determining the best workable options.

OPALCO recognized the need for broadband in the community and the fact that the incumbent carriers were not addressing the issues, much akin to JPUD. Centurylink is the incumbent provider and offered very poor DSL-based service that often broke down, as in 2014 when their fiber connection to the mainland broke, causing a 10-day island-wide service outage. Customer service was poor, and CenturyLink presented no ideas or commitments to address the broadband gaps.

The cooperative recognized that they were in a unique position to help address the broadband issues of the entire community. Like most utility companies, they had enough "structure" in place through their utility assets, management, and financial possibilities to tackle and address the issue of broadband. Given the small, difficult to serve market, relying on outside entities to come in and deliver a solution was infeasible.

As noted above, OPALCO is driven by the same challenges that many rural utility and rural communities, including JPUD, face: how to get affordable broadband to the community without putting the utility company at financial risk.

They knew that whatever solution they developed, it was not going to be without risk, and it was going to require a commitment from all levels of management, government, and the community. They emphasized with the community that they were not there to sell them something; rather, they were there to build something together.

How It Works

OPALCO established a Business Plan for how they could capitalize on their electrical utility fiber assets to make broadband services available to the general public. Business modeling told them it was going to be expensive to build fiber to every premises, both residential and commercial, especially for the more remote or isolated properties. As such, they implemented a hybrid last-mile approach of using fiber to get to many locations where the network could be cost-shared within "fiber-hoods", and using fixed wireless in locations that did not have a financially attractive solution for fiber. This fixed wireless aspect is what makes the OPALCO model different from some of the other models of the region. With the appropriate spectrum assets and proper skillset to manage wireless solutions, an organization can use this paradigm as an alternative and cost-effective solution for robust broadband (more on spectrum and access to spectrum later). As a result, OPALCO offers both fiber and fixed wireless last-mile broadband, both at retail and through a handful of ISPs located within the region. T-Mobile is their fixed wireless and 4G provider.

As OPALCO builds and extends its fiber plant, it looks for opportunities to get to fiber-hoods or clusters of homes that might logically benefit from a collective cost shared last-mile fiber solution. The community is then presented what it will cost to build the last mile and everyone within that community will pay the same price. Some may opt out, in which case the balance is shared by the rest of the community. The end user pays for the last mile charge either via direct funding, or, as with the Kitsap model, by using a local credit union or bank to pay for the construction over time. OPALCO's ISP, Rock Island, will also subsidize the last-mile construction with up to $1,500 in incentives. This financing model means the end user does not have any upfront out-of-pocket expenses but can pay for the build over time. Fixed wireless works much the same way.

OPALCO offers 1Gbps broadband over an active-Ethernet based fiber and an agreed upon speed over fixed wireless. As with everything wireless, results can vary between locations, but the cooperative works with T-Mobile to engineer the desired solution. Fixed wireless can also be deployed much quicker than fiber, so those in the more difficult to serve areas may have to wait years for enough capital to be raised to build fiber to their locations.

OPALCO owns and operates their own ISP called Rock Island. Rock Island was an existing local ISP that OPALCO purchased to help with time-to-market and to capitalize on their experience of providing internet access in the region. Rock Island handles the network management, sales, customer support, CPE installation and general network maintenance. They will also sell wholesale services to other local ISPs creating an open access network paradigm as well.

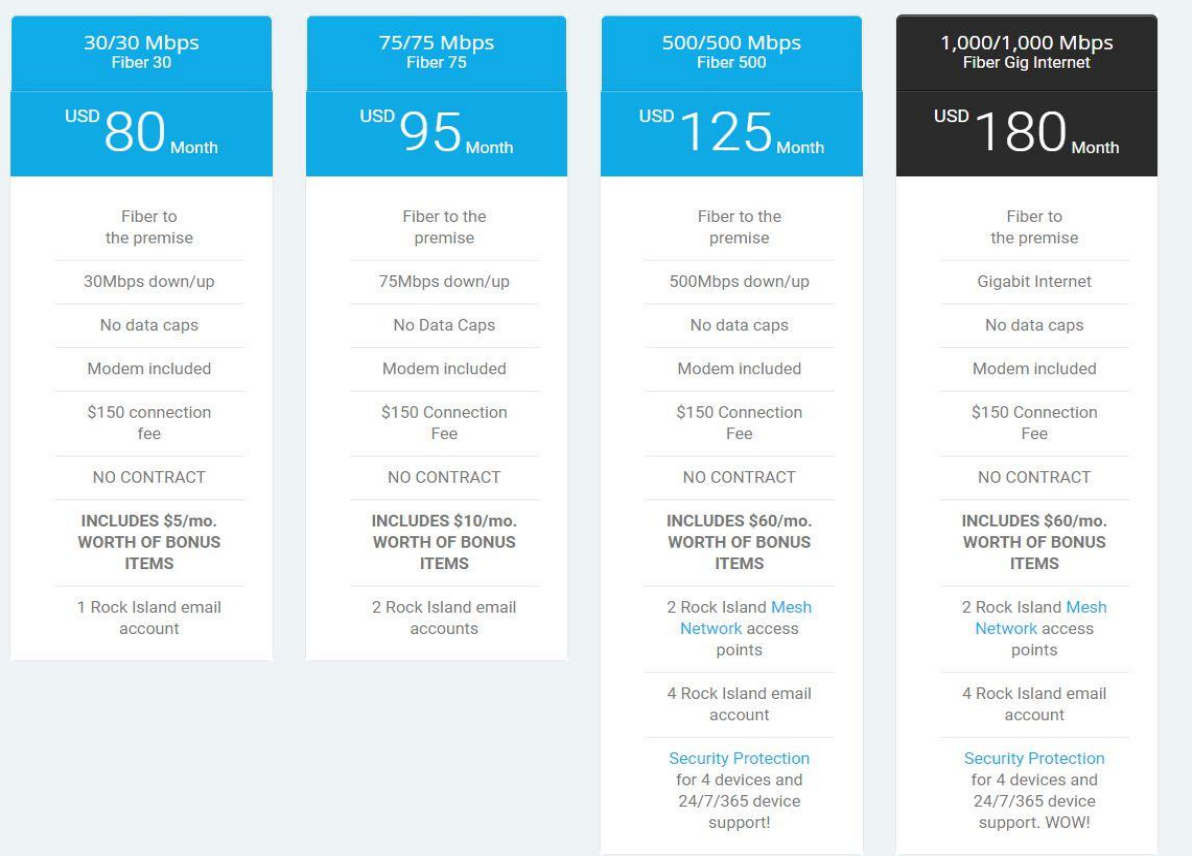
Business Plan

OPALCO has indicated they have a roughly 50% take rate for their service and growing, with expected rates of over 60%, which was greater than they originally expected. They are cashflow positive and plan to further expand the network into other communities. They also indicated they have roughly $25M in capital to support this project with some of those funds financed through a bank and via direct investment by the end users for their share of the last mile. T-Mobile has also made a considerable capital investment in their LTE and fixed wireless offerings. About 35% of Rock Island customers use fiber, 55% use fixed wireless from T-Mobile, while the remaining continue with DSL through CenturyLink lines.

The LTE and wireless portions of the network are the results of a long-term partnership between Rock Island and T-Mobile under which the partners share investment and capacity. T-Mobile can use the fiber, sites, and buildings of OPALCO to help reduce the cost of deployment, while making their LTE network available for OPALCO's own communications needs and for fixed wireless services offerings. The LTE network also supports the communities' first responders and other emergency service agencies. Rock Island and T-Mobile work collaboratively to determine where and at which priority each site gets built. Revenue is shared between the two companies based on their share of investment.

Pricing – Rock Island

Rock Island is one of the more expensive solutions in the region. They offer roughly 4 residential tiers of fiber service including:



For fixed wireless, they charge $75 per month for an up-to service.

Rock Island also offers services in these packages that are not included in the proposed pricing structure for Jefferson PUD including email addresses, Wi-fi access and modems/gateways.

Competition is very limited in the San Juan's. Only CenturyLink offers wired broadband solutions. The San Juan's also have a different demographic than that of Jefferson County.

Conclusion – OPALCO/Rock Island/T-Mobile

According to OPALCO, the key elements and considerations for their business plan include:

- Anchoring the network with the electric utilities existing fiber assets
- Fiber-hoods share equally in the cost of the last-middle-mile buildout
- Focus on encouraging the County to participate as their expanded LTE will benefit their first responders
- Maintain a wireless relationship with an expert on wireless with enough available spectrum assets to make wireless a viable option
- Establish fast time-to-market options to lower the need for loans

OPALCO has taken a unique approach to providing broadband to their difficult to serve community. Their partnership with T-Mobile provides them a level of expertise and spectrum assets that they would not normally be privy to, allowing them to provide an affordable alternative to strictly fixed based solutions.

While OPALCO can provide retail services, many of their methods could be explored and applied to a wholesale open access model like JPUD. Their model is not without risk, but with proper planning, they were able to find a model that fits the community they serve. The OPALCO model combines similar methods to Mason PUD 3 and Kitsap PUD, but adds the expertise and capital for a fixed wireless solution of a large mobile provider.

Conclusion – Broadband Deployment Models

As expected, there are a range of different models to consider, each with varying risks and rewards: Risks in terms of capital, culture, outcomes and solutions, and rewards in terms of providing broadband solutions to a community in need of broadband that spurs economic growth, increases students' ability to learn and grow, and supports all the "difficult to quantify" benefits to the community.

The spectrum of broadband business models ranges from low-risk models that focus only on policy and attention issues, to models that facilitate the utility provider offering retail services to all their service area, which is a much higher risk/reward proposition. Of the models listed above, most sit somewhere in the middle, which is where most utility companies end up. Given the State of Washington's prohibition on offering retail services, that option has been eliminated for the PUD.

Clallam PUD and the Port of Skagit use a fairly low-risk model, but only offer services to business customers through ISPs that pay upfront for last mile construction. Clallam has a staff of about 2 people, whereas OPALCO has almost 40.

Kitsap and Mason PUD 3 offer services to the residential and business community and require the end user to pay for the last mile, albeit through a long-term loan or as an additional fee on their monthly bill. OPALCO is much the same, except they have a less expensive fixed wireless solution available that T-Mobile, their partner, helps to facilitate.

Each one of these models could be deployed by JPUD, so JPUD must address their risk/reward tolerance for what they are trying to accomplish. This Broadband Plan will help to address those issues, including which model and associated potential capital outlay, staffing, management support, regulatory, and partnership solutions would be required to meet the needs of the community.

Figure 5-1. Overview of Industry Role Models

	Mason PUD 3	Kitsap PUD	Clallam PUD	Port of Skagit / Skagit PUD	OPALCO
Offerings	Business & Residential	Business & Residential	Business Only	Business Only	Business & Residential
Funding	End User pays for last mile	End User pays for averaged engineering costs of drops	ISPs lease fiber	ISPs lease fiber	$1500 subsidy from ISP; end users fund last mile
Ownership	PUD owns middle mile; End user owns last mile	PUD owns middle mile; End user owns last mile	PUD/ISPs		
Technology and Features	Overhead or Underground Fiber built out to fiberhoods	Underground fiber build to LUDs; loans available from local credit unions.	Excess capacity for fiber supporting SCADA/Smart Grid	Collaboration of networks to form one larger network	Hybrid Fiber + Fixed Wireless
Staffing	11-12 FTE	4-5 FTE	2 FTE		40 FTE
Network Management	Joint network management with NoaNet	NoaNet manages middle mile	Shared between PUD and NoaNet		
Service Offerings	1 GB for $85/mo.	100 Mbps for ~$60/mo. 1 GB for ~$85-90/mo.	As requested by ISPs	TBD	30Mbps-1Gbps
Model	Open Access	Open Access	Modified Open Access	Wholesale Open Access	Partnership with T-Mobile Rock Island ISP
Investment Risk	Moderate	Low	Low	Low	High

SOLUTIONS FOR JPUD

Wireless Carrier Partnership and Rural Broadband

We will use T-Mobile as an example as they have expressed interest and have experience with providing services and partnership opportunities in the region.

T-Mobile is the third largest wireless carrier in the US and is headquartered in Bellevue, Washington. If their merger with Sprint is approved through the courts, the combined company will put them on par with the two largest carriers, Verizon and ATT.

Most know T-Mobile for their cellular service, but T-Mobile has a plan for deploying fixed wireless solutions as a compliment to their cellular service, especially in rural and hard-to-reach locations. This model allows T-Mobile to partner with local utility or telecom providers to deploy last-mile broadband solutions using both fixed wireless and fiber-to-the-home technologies. T-Mobile brings their expertise and assets to the partnership and the local utility brings their sites, buildings, fiber, towers, and other assets as appropriate for the deployment of broadband. T-Mobile provides network design and management skills, spectrum, and funding to the partnership. The combination of these merged assets has the ability to create a network that can be a win-win-win – a win for the community, a win for the utility provider and a win for the cellular provider.

A fixed wireless solution may well be part of the mix of last mile solutions for Jefferson County. It will be cost prohibitive to get fiber to every home in the short term, so the PUD should look to fixed wireless as part of their overall network design.

To consider fixed wireless, the PUD will need to consider the following:

- What are the speeds required to deliver a compelling service offering?
- What spectrum does the JPUD have access to and is it suitable for meeting customer expectations given terrain and propagation characteristics?
- Is there equipment available to support the spectrum the PUD has access to?
- Does the PUD have enough spectrum available?
- Does the PUD have expertise in wireless deployments and maintenance?
- Does the PUD have vertical assets to support wireless?
- Are there fiber assets available to backhaul the fixed wireless sites?

A partner like T-Mobile may be able to help address some of the issues listed above. They have access to a large portfolio of spectrum that will be appropriate for the environment JPUD is looking to serve, and T-Mobile has expertise in deploying and managing wireless networks. The PUD would provide tower space or property for towers (poles) and other related equipment and would provide fiber backhaul to those

sites. Working together, a wireless carrier such as T-Mobile and the PUD would develop a solution that meets the needs of the community with respect to speeds, uptime, cost and availability.

As part of a potential partnership, the carrier is also interested in expanding their cellular footprint to improve service for all of the proposed region. This would improve service and coverage for first responders and for utility workers working in the more remote areas.

Conclusion – T-Mobile Fixed Wireless

To service more communities in the JPUD service territory with suitable broadband, the PUD should look at a mix of last mile technologies to address those needs, namely fiber and fixed wireless. It is still undetermined what mix of fiber and fixed wireless will be required, but it should be understood that there will be a mix given the cost prohibitive nature of deploying fiber to every location. Deploying fixed wireless will require a specific set of assets and expertise to make it a viable solution. Partnering with a willing company like T-Mobile should be a consideration to facilitate wireless service that will cover currently underserved areas at reasonable costs with relatively fast times to deployment.

WHAT IS A UTILITY BROADBAND PARTNERSHIP?

Even for public utilities in America that can provide retail broadband services, the business of broadband is a new venture, and many utilities lack the technical or organizational capacity or even the desire to stand-up and operate a broadband utility. For those utilities, they may fill a critical strategic need by partnering with a public or private entity expert in network management.

While in Washington a retail partner is required, a public sector or a private sector partner may be considered to fulfill essentially any role in the new broadband utility. Before getting into the specifics of possible business models, this section offers some points around the pros and cons of entering a broadband partnership.

Utilities develop or support broadband partnerships for a variety of reasons. Infrastructure builds in rural areas confront significantly higher deployment costs due to lower customer density, lengthier middle-mile networks, and often challenging terrain. A healthy broadband partnership can address such challenges through sharing of capital costs, enhancing revenue potential, and avoiding regulatory barriers.

Generally, a broadband partnership spreads the risks and costs related to capital investment or business execution challenges. Because the risks, costs, and technical capacity of each utility is different, partnerships reflect local needs while following one of three basic partnership models:

- Private sector led: where a private service provider owns and operation the networks, while community anchors, businesses and residents all support the business case by subscribing to services and local partners help aggregate demand by securing customer service commitments in advance of infrastructure spend. (CenturyLink and Wave models)
- Utility/Public sector led: where a public entity owns the network and private partners construct, operate, and/or maintain the network in exchange for financial support. Such support could be through long-term service commitments. (Hybrid LUD/Fiberhoods)
- Joint Ownership: A private sector network operator and the public sector entity jointly invest in the network and share responsibilities in operating the network. Both partners also contribute a mix of resources to support the needs of the partnership. (Wireless carrier partnership model)
- Build narrative around what you put in is what you are due to get out...
- What roles does the Private provider have, what does the PUD have? Who pays for what, who owns what?

Risk, Reward, Control

As JPUD evaluates its broadband future and considers one or more broadband partnerships, it should consider both the opportunities and the potential pitfalls by paying attention to three interwoven concepts:

- Risk
- Reward
- Control

A successful partnership must complement these three concepts of each partner, and there will inevitably be some tradeoff within this framework for each model. For example, every partner would welcome lots of rewards, but in reaping rewards the partner must be willing to take on a certain amount of risk. Another partner may value more of the control aspects of the broadband partnership, but to do so means that partner must be willing to share in the other aspects.

Risk

It is not possible to entirely avoid risk at any level in broadband deployment. But calculated and measured risk often yields benefits that would otherwise have not been attainable. One of the most enticing components of a public–private partnership is that it can reduce the utility's risk while helping achieve its broadband goals.

Taking on additional debt and finding financial support for the partnership could be one of JPUD's greatest risks, though this could be a worthwhile investment to enable

JPUD to retain some ownership and control of more of the network assets in the service area through a partnership model. Although it will entail some financial and political risk due to required financing, the long-term dividends will be advantageous. This is especially true if JPUD can execute a meaningful partnership with a private entity that will share in the risk.

Trade-offs may continue even if JPUD enters an agreement that doesn't require it to directly seek capital investment, for example, it may find a partner that is willing to use its own capital to build network segments or own more of the "last mile" and customer connections. Even if JPUD does not directly seek financing, it must commit to a guaranteed payment schedule and its credit rating could still be impacted if a private partner arranges the financing.

Managing retail broadband networks is costly and ever-changing, and as such introduces new risks for utilities. In states where utilities can enter the retail market directly, they are often targeted by hostile incumbent providers that make it challenging for the broadband utility to compete. Part of the attraction to public–private partnerships is that private entities operating in this competitive space today are accustomed to managing these risks. So, in this regard, the partnership strives to leverage these capabilities to reduce risk for the utility, and by extension, the partnership. Given this, a partnership model is most likely to lower JPUD's risk.

Reward

As JPUD considers expanding its fiber infrastructure throughout more of its service area, it should continually weigh the benefits it expects to receive as part of a partnership against its potential risk. One component is the potential for a great degree of flexibility between partners, as financial returns are not the only reward valued by some public sector partners. As such, this is often the attraction for private sector providers to seek a partnership with a public sector entity. Understanding this, JPUD should consider its priorities and pursue those benefits and rewards on the front-end of a partnership arrangement.

Although public–private broadband partnership models are relatively new and evolving all the time, there are model examples that JPUD will look to as guidance on how it might want to proceed. As it evaluates a partnership for itself, JPUD must begin by asking what are the rewards and benefits that it would like to see from the fiber initiative. Are economic development opportunities and "off balance sheet" community benefits good enough for JPUD, or would JPUD like to show more direct financial returns?

While most benefits can be estimated, JPUD can determine how to balance its risks and rewards, which will allow it that opportunity to consider which key areas to focus on in its pursuit of a partner. While JPUD is a rural market, it can be a desirable market

with much to offer a private partner, especially if JPUD is willing to invest in the fiber network backbone.

Control

Because this is the start of JPUD's broadband journey, it can choose during the negotiation process its desired level of involvement in infrastructure deployment, network maintenance, and operations. That is, JPUD can determine from the outset what level of involvement it would like to have at every stage and in every arena of the public–private partnership process.

While state law dictates much of the end-to-end retail network that JPUD can control, this provides more certainty for JPUD to make decisions about placement of assets, rate of deployment, and the overall network footprint. Further, it ensures that if the partnership fails for any reason, JPUD still has a physical asset that it can use to negotiate a new partnership or begin its own direct retail operations, should state law change at some point.

There are ways that JPUD can retain more control within the public–private partnership, and the most important way is through retaining ownership of physical assets. This must be balanced with risk, as it is likely that JPUD will be required to fund part of the capital investment, yet the more ownership it has in the fiber asset, the greater degree of control it can maintain.

Network Management, Operations and Sale and Marketing Responsibilities in a Partnership Style Model

In a carrier partnrship style arrangement, the following are typical roles and responsibilities of each entity. However, keep in mind that everything is negotiable.

- Revenue:
    - Shared based on negotiated terms, but generally based on prorations of capital and other contributions
    - Joint determination of prices, service levels, service offerings
  - Capital Contributions
    - Negotiated between the partners
    - PUD has physical assets to contribute
    - Partner may bring spectrum assets
    - Joint asset builds to new areas could be shared costs
  - Operating Costs
    - Shared – each partner will have their individual staff
      - PUD –
        - Broadband Manager

        - Sales and Marketing Coordinator (includes ISP facilitation)
        - Local installation and repair
    - Partner –
        - Broadband Director
        - Sale and Marketing coordinator
        - Local Sales Offices
        - Network management and security
        - Engineering
- Shared expenses for internet access, legal, regulatory compliance

These partnerships can be structured in many ways based on the ultimate desires of each partner member.

Network Management Contractor Model

In the Hybrid LUD/Fiberhood, the PUD would contract most services out to an outside vendor. This vendor would be paid for services rendered, not for a percentage of profits. The services the PUD should consider outsourcing include:

- Day-to-day network management operations. Given the PUD will not be delivering retail services, the network management requirements will include keeping the network up and running and in compliance with service level agreements (NoaNet performs this operation today)
- Network installation including middle mile and last mile services. The cost models included in this model represent all new construction to be provided by an outside contractor. End user installations will be done by the selected ISP's.

What an outsource vendor should **not** be responsible for: (responsibilities of the PUD)

- Sales and Marketing
- ISP Training, attraction, and retention
- Billing
- Planning
- Local technicians capable of addressing immediate service disruptions in the physical plant
- Fiberhood location and definition
- Grant applications

Network Management costs can be contracted on a minimum per month basis or can be setup as a per user per month fee. Sometimes contractors will incorporate both into the contracts

SPEEDS AND TECHNOLOGIES OF SERVICES DELIVERED

The recommended models call for either partnering with a wireless carriers such as T-Mobile to build, manage, and support the network, or implementing a hybrid LUD/Fiberhood Open Access Model in which the network is managed more closely by Jefferson PUD or selected contractors.

Both models will require a review of what services should be delivered (and for what prices) to satisfy the needs of the community, both residential and commercial, while balancing the costs associated with meeting those requirements. For instance, the gold standard today is to use fiber as the technology to deliver both the middle-mile and last-mile infrastructure. Fiber can offer speeds and features that other technologies cannot, including the ability to deliver speeds of 1-2Gbps today, with increases in the future. However, getting fiber to every home is cost prohibitive so other technology solutions should be considered. What are the minimum speeds and features required to make a viable solution that satisfies the needs of the community, while still making business sense, given the challenging terrain and rural nature of the region?

JPUD should look to deploy fiber to every home that can be cost-effectively connected to fiber. Cost effectiveness is subjective, especially given that the models call for each end user to help cover the costs of the last mile. Many similar deployments have tried to keep the combined cost of middle mile and last mile costs (backbone to middle mile to last mile) to roughly $5,000 per home. If the cost is over $5,000, then other alternative technologies start to make more sense. Each fiberhood will have to make that decision collectively, but the PUD should be prepared to offer an alternative if the cost anticipated to be over the $5,000 threshold. The alternative is fixed wireless.

The question of how much bandwidth a fixed wireless solution can provide is always "it depends". Fixed wireless, unlike mobile solutions like cellular service, relies on fixed tower locations talking to fixed antennas located at the customer's site. The amount of data and speeds it can provide is dependent on several factors including:

1. *Propagation characteristics.* Fixed wireless uses spectrum to transfer data from one location to another. Not all spectrum is created equal in that the higher range (5GHz and above) does not transmit very well through walls, buildings, glass, trees, hills, or other impediments that may exist between the two access points. However, the higher the spectrum, the more bandwidth it can carry, albeit over short distances. Lower spectrum (600MHz-4GHz) can propagate through walls and foliage, but carries less speed and data. Network engineers work hard to balance spectrum availability, desired speeds, environmental characteristics (terrain, foliage, walls), and costs. Generally speaking, the higher speeds required, the more sites will be required, thus increasing the overall costs.

2. Desired Speeds and Service Expectations. If the end users require 500Mbps of broadband, network engineers can deliver that speed IF they have enough of the appropriate spectrum, vertical assets, sufficient backhaul, near line-of-site capabilities, access to affordable hardware, and the funds available to provide that solution. Network engineering for fixed wireless can be done generally using known environmental characteristics, but for each potential community, an RF study will need to be conducted to help determine ultimate network costs to deliver the speeds desired. Many fixed wireless solutions today focus on delivering a 25/3Mbps solution in keeping with the FCC definition of broadband and balancing network costs.

3. Spectrum Availability. Spectrum is a finite resource. In the US, it is managed by the FCC. Some spectrum is made available for use by anyone (for example, 2.4Ghz used in Wifi), while other spectrum is semi-regulated (such as 3.5GHz), and yet other spectrum is available only to the license holder after purchasing the rights from the FCC. It makes sense that more available spectrum translates to better speeds; however, unlicensed spectrum, such as that used in Wifi, can get very congested, which affects performance and the end user's experience. Licensed spectrum is not available to anyone other than the licensed owner. Companies purchase licensed spectrum so they can have a controlled, consistent end user experience without worry of interference from other sources. Many utility providers, and even some of the local small ISPs, do not have access to the necessary appropriate spectrum to deliver a satisfactory service. End users of fixed wireless often complain of slow-downs in speeds at certain times of day because spectrum is a shared resource. Users may also find that service degrades during certain weather conditions or at certain times of the year when there is heavy foliage on the trees. Partnering with a carrier like T-Mobile can make the pursuit of fixed wireless solutions less onerous and more viable, given that they bring with them large spectrum portfolios not available to the general public.

4. Hardware Availability. A utility company may have access to some hardware used for communications or even for point-to-point backhaul purposes where fiber might otherwise be too expensive. Some have indicated that they have spectrum and assume this same spectrum use for microwave backhaul purposes could also be positioned and provisioned for last-mile solutions. That is not always true. Hardware supporting microwave solutions is abundant, but there is limited hardware available, in that same spectrum range, for supporting last mile options. The spectrum used for microwave, which is a line-of-sight solution, may not be appropriate for last mile deployments.

Marrying available spectrum, hardware availability, and affordability in the JPUD service area while matching the broadband needs of the community will be a balancing act that needs to be studied and refined over the years. Fixed wireless

will need to be part of the solution as it will be cost prohibitive to provide fiber to every home. However, delivering fixed wireless is a skillset quite different from fiber deployments.

We recommend starting with a 25/3Mbps fixed wireless solution when fiber is cost prohibitive.

BACKBONE VS MIDDLE MILE VS LAST MILE

The question often gets asked about who is responsible for maintaining, building and managing which parts of the end-to-end network.

When preparing a business plan and the associated financial models, we break down these segments into distinct categories as it helps define this ownership and stewardship of each segment.

The backbone network (sometimes also called the middle mile) network consists of generally a fiber-based network that connects all communities, offers redundancy (ring) and is often comprised of hundreds of pairs of fibers. This backbone network is essentially what the PUD owns today (although it is often referred to as a middle mile network). In order to reach a potential fiberhood, some middle mile may have to be built from the backbone to that community. This middle mile will aggregate network traffic from every subscriber and haul that traffic to the backbone, which then gets that traffic to the internet and back. From the middle mile, we build the last mile, or network drops as they are sometimes called. These drops carry only network traffic for the single location they are intended for. In an OAM network this last mile is owned by the end user/subscriber or the PUD. In case of DSL for instance, the last mile is copper based twisted pair wires. In a FTTH network, the last mile is a pair of fiber strands. In a fixed wireless network, last mile traffic is carried via spectrum.

The backbone network cost is shared by all users on the network. The middle mile (in PUD's model) costs will be shared by the fiberhood, whereas the last mile network costs will be the responsibility of the end user (or sometimes the PUD). Last mile costs also include any network equipment, or Optical Network Terminals (ONT's) in the case of fiber, that is provided in the OAM model. The collective costs of the prorated share of the backbone, middle mile and the entire last mile costs and equipment, are what constitute the Cost Per Subscriber. In the PUD's case, the backbone network and even some of the middle mile network, will capitalize on the PUD's existing assets making the overall CPS more reasonable.

As noted above, this last mile can be fiber, fixed wireless, cellular, satellite, DSL (twisted pair wire) or coax cable. Each technology has its strengths and weaknesses, and some are used only because they have been in place for many years to support other services but adapted to support internet access. DSL uses twisted pair copper

wires to deliver broadband that was traditionally used to supply voice services. It has since been adapted to support internet. Cable services follow the same methodology using coax, which was used to deliver TV services, but now acts as a medium to also deliver broadband.

Demarcation Point

From the handoff location on the middle mile network, the last mile usually extends to a demarcation point on the side of the house or business. From this demarcation point, service extends into the home or business and is generally the responsibility of the ISP to support. The PUD responsibility will include the middle mile and the last mile infrastructure up to the demarcation point. In the past, some ISPs have owned the last mile, but in an Open Access Network scenario, the PUD needs to own both the middle mile and last mile network. End users are then free to select their own ISP that has services capable of riding over the last mile and middle mile segments.

The PUD will be responsible for all the equipment (Optical Network Terminal, or "ONT," in the case of fiber) including its installation, maintenance, capabilities and upgrades. It is at the ONT that the PUD hands off service to the ISP. Not all ONTs are created equal and the PUD will have to select the features and benefits of each, along with the appropriate supplier, in determining which solution is best suited for their environment and service offerings. Price, capabilities, manageability and features are all important factors to consider in selecting the right end-to-end solution.

ONT's range in price from $150 to $450 each, depending on features.

Some common features of an ONT include:

- Battery backup
- Voice Support via traditional POTS ports
- Coax connector support
- Centralized network management
- Smart Home
- Smart Grid/Power Connections
- Gigabit and Ethernet Ports

Some ONTs are placed just inside the home or business. They often then integrate features like Wifi and traditional gateway functions.

Fiber-based last mile can either be buried or it can be aerial (on poles) from the handoff to the home or business. Aerial can cost less but is not always the right solution. If bad weather or falling limbs and trees pose a threat, underground solutions should be considered. Underground trenches can be built using various techniques including digging with a pick and shovel, backhoe, trencher, or even horizontal boring processes. Terrain, distance, and cost will dictate which solution is best.

The PUD should also consider future smart meter solutions when planning how to deploy last mile and which technology and associated construction method is best. If the electric company can share the costs, it will make it much more affordable to the broadband business.

Constructing the last mile can be done with existing staff and equipment, or can be contracted out to an approved contractor that specializes in last mile construction. Mason 3 retains a staff dedicated to last mile construction, whereas Kitsap contracts all their projects. Magellan's recommendation is to contract the services to keep staffing needs to a minimum. Over time, and as the initial installation rush subsides, the PUD could reconsider this approach.

Last Mile Cost Sharing - Fiberhoods

The proposed business models call for the identification of unserved or underserved communities that can be then targeted for potential broadband access, should enough people in that target area agree to subscribe and to help with the last mile costs. These targeted areas are often referred to as fiberhoods, taking the name from Google's foray into providing broadband access. These fiberhoods are clusters of homes and businesses that, if presented with a plan and associated costs to provide them broadband, can collectively agree to the plan and contribute to the last mile costs through financing or through the LUD vehicle that will be made available to them. In Mason 3's case 80% of the fiberhood must to agree to service before the PUD will commit to any construction.

This commitment reduces the PUD risk of building to nearly nothing. The PUD is responsible for the backbone network, network management, staffing and other operating costs, but the end user is then a contributor to their share of middle mile and last mile. Nothing gets built until at least 80% of the community agrees to take service at the proposed price.

In determining the costs that each home would be responsible for, the PUD needs to consider not only the cost of a traditional last mile, but also the cost of any middle mile that would need to extend from the PUD's existing network (backbone), out to the community, and then the traditional last mile. Example, if there are 20 homes identified to create a fiberhood, but those homes are located 1 mile from where the middle mile is located, then the collective fiberhood would be responsible for the shared cost of getting fiber to their community, and then to each home that agrees to subscribe. For a fixed wireless solution, the fiberhood community would be responsible for the cost of getting fiber to the supported tower, but not for the fixed wireless equipment, as that equipment is not generally considered a physical asset and banks and credit unions may be reluctant to finance it.

Identifying and Facilitating Fiberhoods

This Report provides some examples of potential fiberhoods for the region. It is by no means an exhaustive list, it does not cover the entirety of the region, but does target some of the areas that the survey and other results demonstrating an unmet need for broadband. Once the fiberhoods were identified as potential markets, a high-level engineering assessment was done, followed by associated costs to deliver to each home, followed by the potential price to the end user. Lastly, it shows the annual revenue for that fiberhood to the PUD.

Marketing Requirements for the Fiberhood

Designing the appropriate network for the fiberhood is based on user expectations of both broadband speeds, service and end user monthly costs. Here are the expectations/goals that these fiberhoods are trying to meet:

1. 1Gbps/1Gbps symmetrical broadband
2. $85-$95 MRC
    a. $40 to PUD
    b. $25 to ISP
    c. $20-$30 per month in last mile cost
3. 80% take rate before starting construction

Service Levels

1Gbps/1Gbps is the target speed for each fiberhood. While some will contend, and are probably right, 1Gbps speed is more speed than anyone can use today. Gigabit service has been somewhat of an industry benchmark for marketing reasons for several years and many end users are familiar with the term. To them, it means world class speed and service. Magellan recommends providing only one service level. This issue of only delivering one service level and not many tiers, has been the subject of discussion and debate ever since fiber networks were built. The modern reality is that when using fiber, the cost of providing gigabit service is no more than providing 100Mbps service, or at least very negligible. While not true of fixed wireless or DSL service, it is true of fiber services. There will be those in the community that cannot afford or do want to pay $85-$95 for broadband. They will probably ask for a less expensive option, but reality for the PUD is that providing a service with less speed at a less expensive price, when the build costs are the same, means the PUD will struggle to meet its financial obligations for the network. Some have also argued of offering a 100Mbps service at $70-$80 and a 1Gbps service at $150. The PUD would certainly be wise to consider that (as OPALCO and Kitsap has done), but it will affect the overall network financial picture and muddy any predictability until experience is learned and applied.

Magellan's recommendation is to keep everything, including pricing, simple and uncomplicated.

Identifying and Prioritizing Fiberhoods

When identifying potential fiberhoods for approval (and ultimate proposal to the given community) several techniques should be considered:

1. Community Requests. An online portal should be established to help identify areas of potential interest for broadband. An online request should be made by the end user and when enough potential users show interest, the process of establishing a fiberhood can begin.
2. Proximity to existing backbone fiber assets. The targets fiberhoods, to help reduce overall costs, should be located within close proximity of existing backbone fiber owned by the PUD. To reach potential neighborhoods, some middle mile will have to be built from the backbone network to the fiberhood. If this distance is too great, the shared cost, reflected in the end users MRC gets to steep.
3. Underserved or Unserved communities may get most attention. Pent up demand for broadband is mostly likely in unserved or underserved communities and those areas can be easy wins for broadband services.
4. More competitive communities. The same fiberhood opportunities should be made available to all areas of JPUD's service territory, even areas like Port Townsend, which already has DSL and cable service. These communities, like those in less populated regions, can elect to get broadband from the PUD under the same conditions that unserved or underserved regions can. For the PUD, it opens the available market and represents the opportunity to get more users contributing to the bottom line of the PUD and to help cover opex expenses.
5. New backbone builds yields new fiberhood opportunities. As the backbone matures and grows over time, new fiberhoods can and should be developed. Oftentimes, new build costs are offset by grants, making them even more viable to these new possible communities.

Facilitation of a New Potential Fiberhood

Once a community has been identified using the criterial listed above, the logistics of facilitating that fiberhood will require the following:

1. **Detailed engineering**. Engineering will need to design a detailed network plan including middle mile, last mile and all other associated costs.
2. **Present Plan to Management and Commissioners**. In an LUD model, the Commissioners will approve all new fiberhoods setting in motion the series of next steps required to present the option to the community.
3. **Present the fiberhood opportunity to the targeted end users**. This targeting can be via email, phone calls, site visits, community meetings, website referrals and via banners or other advertising materials. The materials

should layout the specifics and expectations for each individual fiberhood and then provide feedback on their progress towards meeting those goals.

4. Once the goals have been reached, **construction is scheduled** and communicated with the community. Engineers will meet with each individual home/business to find the best solution for the last mile so it meet customer expectations.
5. If using the LUD model, **end users are provided information on how to engage with local financial institution**s to help cover their costs of the project.
6. The **financial institutions provide the PUD with construction funds**
7. The **PUD contracts with a contractor** (initially) to build the network.
8. **End user selects an ISP**
9. **Billing is setup and contracts signed**

JPUD's service territory may not have as many obvious logical fiberhoods as other communities, but using GIS data, this Plan has identified several areas that are underserved, unserved and close together. In deciding how to deploy to additional fiberhoods, JPUD should refer to the maps in this plan to identify areas of demand.

Costs for Last Mile

Magellan is privy to many pricing structures for the deployment of last mile infrastructure. Costs are dependent on terrain, soil type, underground vs aerial, depth requirements, distance, obstacles, accessibility, yard/soil restoration requirements, and labor costs. In more densely populated regions such as urban and suburban environments, per-foot costs increase given the need to traverse concrete driveways, sidewalks, sewer and water line, asphalt, and other utilities. However, this is offset by the short distances they need to occupy. Also, contractors can complete a lot of installations in a short period of time, given the close proximity of each location.

In rural environments, much like Jefferson County and the targeted regions of the PUD, the costs for last mile will be strongly based on distance. Homes and businesses are not always situated close together, so the cost-per-home is often driven by the distance a drop (last mile cable) needs to go. Jefferson PUD will need to decide on which methods are most appropriate for each situation as they may not all be the same. Some may be installed using buried fiber, while others might be better suited with aerial solutions.

Distance is also dependent on where splice facilities are located. When the middle mile infrastructure was initially installed, it may not have been engineered with the prospect of being used for residential or commercial services, but instead, engineered to connect facilities. As such, there is the possibility that some fiber may not have convenient splice facilities, which may result in increased distance considerations or the need to install additional fiber infrastructure.

Additional costs for last mile infrastructure include design/engineering and the ONT electronics required.

The network will be built in an Active Ethernet and GPON scenario.

Magellan recommends JPUD contract the installation of all last mile infrastructure.

Fiberhood Cost Assumptions - Fiber

1. Aerial deployment
2. Installation costs $18 per foot in most areas. $25 per foot in Port Townsend
3. $1,500 *average* cost per lateral in rural. Aerial or buried. Includes ONT. $1,250 in Port Townsend
4. End user financing terms of 180 months
5. 70% of users need to agree.

Given each fiberhood is unique, there are some differences in the ultimate calculated end user price between each community. Some communities had a price as low as $73 per month, while on the other end, as high as $114 per month. Most fiberhoods ended up in the $90 range. Each community will be presented with their costs and then could accept or not accept the solution. If more than 70% of the community agrees, then the overall costs for each will be reduced accordingly.

PRODUCT OFFERINGS – OTHER REVENUE

Owning and managing a broadband network opens many avenues for the delivery of products and services. As noted elsewhere in the report, a broadband network can be used to support smart grid, Smart City, public Wi-fi, connect anchor institutions, EMS, schools and other entities throughout the community. Some of these uses can generate revenue, while others may be public benefit solutions provided to the community.

There are several categories of products and services that JPUD could make available for sale. A full conceptual explanation of each model can be found in Chapter 6 of this plan. The options below describe how JPUD, specifically, might be able to offer each product or service. Note that JPUD is restricted from offering retail services, but an understanding of those services is still warranted.

1. Residential and commercial internet access
2. Dark fiber
3. Lit services
4. Point-to-point Ethernet
5. Co-location

1. *Residential and Commercial Internet access.* The largest unmet broadband need in Jefferson County, is for robust residential and business internet access, especially

in the more rural communities. This Plan recommends that Jefferson PUD sell wholesale access to their network that participating ISP's then use to provide the retail user access to the internet. The PUD or the consumer would own the middle mile and last mile portions of the network. These services are generally sold on a monthly fee basis, sometimes with a contractual commitment of 1-2 years.

2. *Dark Fiber.* JPUD could sell excess dark fiber strands in its conduit to interested parties. In this situation, the end user supplies all their own electronics and network management and the PUD supplies only the physical strand. The company leasing the fiber can do whatever they want with the fiber in terms of use, speeds and applications run over it. Often times, dark fiber is used to connect two branch offices together for organizations with multiple locations such as schools or hospitals. JPUD's dark fiber could also be leased by middle mile providers traversing the PUD's territory with a need to connect their other network assets. Dark fiber can be a profitable business given there are no network management requirements (other than physical) assumed by the PUD. The downside is that the PUD may eventually run out of fiber strands depending on how many strands are initially available. Dark fiber is priced using a monthly flat rate or rate based on distance required.

3. *Lit Services.* Unlike dark fiber, lit services offer broadband based on speed and data usage with an associated Service Level Agreement (SLA). The PUD will sell specific speeds, such as 1Gbps service to the end user. Lit services require additional network hardware and management capabilities that dark fiber does not. Subcategories of Lit services includes Direct Internet Access (DIA) and Best Effort solutions. DIA is a non-shared or non-oversubscribed solution; only the end users' traffic will occupy or use the frequency reserved for DIA solutions. DIA has the best performance, but at a much higher price point. It is not quite dark fiber, but close.
   Companies needing DIA solutions will require robust internet access that is very reliable and never congested. It is very rare for a residential or small business to subscribe to a DIA offer. It is NOT like oversubscribed DSL and cable-based systems that many people experience where the network slows as more people get on simultaneously.
   Most providers manage their best effort solutions very closely to ensure that SLAs and performance expectations are being met. Best effort solutions are much less expensive than DIA alternatives. 1Gbps DIA solutions can average about $1,250 per month, where a 1Gbps best effort solution may be $80 per month.

4. *Point-to-point Ethernet*. P2P solutions offer Ethernet connections from one branch office to another. In essence, they are part of the end users' current local area network that connects them with another site. Banks, stores, schools and government entities will often need to connect their facilities together so internally it looks like one network.

5. *Co-location.* While not a broadband service, many utility companies offer their physical facilities to other ISPs or providers as co-location points. These companies need secure facilities with power, rack space, lighting, back-up, air conditioned and access for their own electronics. The PUD can offer these services to other providers or ISPs for a fee. As an extension, many private companies are looking to co-locate in these facilities for their own network hardware. They benefit from the secure locations, rack space, power and other amenities these co-locations can provide. Gray's Harbor PUD indicated a bulk of their revenue come from co-location leases.
6. *Other: Vertical asset lease & conduit lease.* The PUD could lease both its vertical assets, including buildings, poles, and towers, for antenna placement for wireless solutions and its conduit for use by third party entities. In many, cases, the use of these valuable assets can be leveraged for in-kind considerations which may include cost savings for fiber deployment.

PRODUCT PRICING

Magellan recommends JPUD consider offering products in all the revenue "buckets" listed above, however not all at once. We recommend the PUD focus on providing wholesale residential and commercial best effort and DIA services. Dark fiber and P2P Ethernet can be explored as the business plan is developed, but JPUD should focus on residential and commercial services for the initial offering.

Determining the appropriate pricing structure is often both an art and a science. We sometimes know what we want to charge for a specific service, but justifying that price can be difficult. Here are a few things to consider when determining end user pricing:

1. **What services are your competitors offering, and at what price?** Understand the true out-of-pocket costs to the end user. Introductory prices are often only good for a few months. Are they offering an "up-to" speed, as with DSL? With the exception of fiber, most technologies do not deliver the actual advertised speed. Are there taxes and/or other fees not included in the advertised price? Do users have to rent any additional equipment? Each market is different; some have a lot of competition, which drives down costs, while others have few choices, keeping pricing relatively high.
2. **What pricing will the general market support?** We might all like to charge $150 per month for 1Gbps service, and for some people, this is feasible, but not for everyone. When asked what speeds they are seeking, many end users reply that they will take whatever they can get for $49.95. They have a budget and want to get the most for that amount instead of basing their budget on the speeds they need.
3. **Most users do not know what they need.** Many users do not know what specific speeds they want or need. Most people know that when their TV streaming is slow or buffers, they might need more speed. They also know

they need more data allowance when they get an overage fee added to their bill at the end of the month. Those with very slow speeds recognize better the need for faster more reliable service. Most end users are unfamiliar with the technical jargon, making it difficult to compare one service to the next. They often rely on their own experience with the service and their perceived issues and then try to determine, in their estimation, what is causing those issues. Are internet speeds too slow? Are they getting actual speeds that meet what is advertised? Is congestion occurring when too many users simultaneously use the internet, as in the case of DSL or cable? Do they experience weather related issues, as in the case of satellite?

4. **End users do know when customer support is bad**.

MARKETING AND SALES APPROACH

JPUD is required to sell retail services through ISPs and not directly. Therefore, the pricing and revenue realized by the PUD will be at the wholesale level. We can make recommendations and observations about resultant end user pricing, but it is somewhat out of the PUD's direct control to decide what the end user pricing will be based on the ISP's mark-up and additional services offered.

Total out-of-pocket expenses for the end user may include:

1. *Retail price charged by the ISP.* Reduced pricing could be realized through annual contract commitments.
2. *LUD or last mile finance fee.* Mason 3 charges $25 per month for 12 years to cover the cost of last mile. After 12 years, or if the end user pays it off sooner, the end user price is reduced by that $25 per month
3. Any additional fees the ISP might charge for prioritized service, equipment rental or other services such as TV, voice, smart home or security.
4. There are no taxes or additional fees the PUD is required to charge.

Keep It Simple

Magellan recommends that the PUD provide very few simple to understand service offerings. For fiber-based residential customers, we recommend the PUD offer a 1Gbps/1Gbps symmetrical service.

The temptation is to offer multi-tier products and service, but in reality, only few select advertised services should be warranted. We acknowledge that 1Gbps is overkill for nearly every user, however, it does not cost the PUD any more to deliver 1Gbps than it does to deliver 10Mbps once the fiber is in place.

Determining how many subscribers will sign up for 1Gbps vs 100Mbps can be difficult. Our assumption is that most of the community would sign up for the lower, less expensive tier, or roughly 60% of the total subscribers. It is a balancing act as some

users will only want to select a less expensive solution, but it costs the PUD the same to deliver slow speeds as it does to deliver higher speeds.

The PUD should position this network as a community shared network in which everyone can enjoy the same outstanding service for the same low prices. With that in mind, our experience has been to keep it simple and fair in a market like Jefferson County.

Offering 1Gbps has also become quite a marketing engine. When Google started offering 1Gbps service, they set the new bar for internet service. Being labeled a gigabit community will increase visibility around the nation for the region as a great place to live and work.

Our recommendation is for an all-in retail price of $80-$90 for 1Gbps/1Gbps symmetrical service using a best effort paradigm. This also assumes an average $25 per month allowance for the last mile contribution.

a. 1Gbps/1Gbps symmetrical service. Same speed on the upstream and downstream (better than DSL, cable, fixed wireless or satellite).
b. PUD will follow net neutrality rules. No blocking or throttling of sites.
c. No monthly data caps
d. No additional taxes or fees

For fixed wireless, the PUD should deliver a 25/3Mbps speed, but at a lower price point. Our recommendation is to offer a price of $60 per month with the same considerations as listed above.

A Note on Wireless Carrier Partnership: Any wireless carrier partner such as T-Mobile will certainly have their recommended/desired price assumptions, so these recommendations are subject to change.

These recommended service offerings are based on the experience of other like PUD offers in Washington and based on what competitive providers are offering today.

When financial modeling, we can “turn the dials” to test different pricing scenarios and the impact on the bottom line. For instance, if we raise the price, we may not get as many subscribers, so revenue could go down or remain neutral. If we lower the price, the business may not be profitable or push out the ROI expectations into later years.

The PUD needs to charge enough to support the network including covering monthly operating obligations, initial investment and ongoing network maintenance including salaries and wages.

Pricing also needs to be able to support an ISP mark-up suitable to attract ISPs to engage and deliver these services.

Commercial Services

For businesses, the PUD should also offer a Direct Internet Access (DIA) service, which differs from the best effort service described above. A 100Mbps and a 1Gbps DIA service should be offered. The 100Mbps DIA should be wholesale priced at $400 per month, while the wholesale 1Gbps DIA should be $1000 per month. The business could also purchase the residential solution if they choose.

Attracting ISPs

ISPs come in all shapes and sizes. Some will be large, nationally recognized entities, while others might be small mom-and-pop shops local to the area. Many end users in rural America are more apt to support a local ISP than a national one given familiarity and preference for supporting local businesses. These local shops may provide a better customer service experience because they are often able to respond more quickly since they are local to the region. However, some of these small shops lack the value-added services that many subscribers want including TV/cable and voice support.

In the middle of the pack are ISPs that are regional in nature. They often serve end users in several OAM models covering a regional geographic area. They often have access to TV/cable and voice services for the end users. Some have rather robust customer support systems that the end users enjoy – still a local feel, but not a national chain.

The success of the PUD's broadband network will rely heavily on their ability to cultivate and maintain an active and healthy network of ISPs that are actively engaged in the market and have the wherewithal to support and implement their services. In essence, the PUD should look at it as a competition to attract ISPs and have them spend time in JPUD's environment promoting and selling services.

The ISP is the PUD's customer, not the end user. Catering to them will be critical to JPUD's success.

To attract ISPs to the market, the PUD should consider the following:

1. **Have an understandable broadband plan**. Without a plan in place, ISPs:
    a. Will not know how to work with the PUD, creating confusion;
    b. Will not have confidence that the PUD will be there to support them long-term; and
    c. Spend too much time cultivating and navigating business opportunities, reducing their potential profit.

    If it is too difficult to understand how to work with the PUD, they will spend their resources elsewhere.

2. **Create an ISP "portal,"** available just for the ISPs, that allows them to:
    a. See where the upcoming opportunities exist so they can plan;
    b. Engage with the PUD on potential opportunities; and
    c. Get training and updates on the latest network and business conditions/changes.
3. **Develop program for collaborative sales and marketing activities**. Sales and marketing can be expensive, so provide an opportunity and program whereby the ISP can engage and jointly market and promote the service offerings. (Much like the Dell commercials we see with "Intel Inside". The messaging could be something similar to "Powered by Jefferson PUD Fiber…")
4. **Understand their business model**. Understanding their business model, how they make money, where their pain points are, and what keeps them from securing new business or maintaining existing business, will allow the PUD to provide collaborative solutions to make sure they are successful so JPUD can be successful. Price products competitively at the wholesale level.
5. **Make it understandable and easy to work with you**. ISPs' time and resources are valuable. If they find it too difficult to work with the PUD, they will spend their time elsewhere. Provide clear guidelines and training on how to work with the PUD, what the PUD will provide (sales support, design engineering etc.) to help increase their productivity and profitability. Most of the support will be pre-sales support.
6. **Create a position within the organization that focuses directly on the ISPs** and supporting them. This person will create and update materials, training, processes and procedures, and ISP technical support. This person will be the liaison between the ISP community and the PUD and will represent their interests and concerns to the company.

ISPs compete through the products, services and support they provide end users over the PUD's network. They need great support, fair pricing, and confidence that working with the PUD is in their long-term best interests and can be profitable for everyone. The PUD cannot assume that if it builds, they will come. It will take an active process to cultivate and grow a robust ISP community. Again, the PUD's customer is the ISP, not the end user. Making sure they are supported will be key to the PUD's success.

EXTERNAL PARTNERSHIP ROLES AND RESPONSIBILITIES

For its part in any future partnership, JPUD will likely focus mostly on physical infrastructure in the JPUD service area – much of the same the "poles and wires" work in public rights-of-way as it currently practices – and likely to be less involved on retail customer facing aspects of deployment and operations. These are some of the critical roles, items, and processes that will require an understanding between partners about which partner will be responsible for providing for each.

JPUD STAFFING ROLES AND RESPONSIBILITIES

Developing, supporting and managing a telecom utility from a staffing perspective has many options available to the PUD.

First, we need to take into consideration which type of business model the PUD will adopt. Magellan's current recommendation is to support either the wireless carrier partnership model or a LUD/Fiberhood hybrid model. Each model will have potentially different staffing and organizational requirements.

Wireless Carrier Partnership

The intended model/partnership with a wireless carrier such as T-Mobile could mean that T-Mobile will be responsible for a lot of the operations including:

1. Real-time network management
2. Issue identification
3. Sales and Marketing
4. Customer Support (commercial and anchor customers)
5. Network design contributions

The PUD would be responsible for:

1. Local project construction management
2. Physical network issue resolution
3. Network design contributions
4. ISP collaboration, training
5. Billing (of the ISP)
6. Ensuring fiber is used for services other than residential or commercial broadband
7. Managing their own SCADA network

The PUD would need the following staff positions (some full time, other part time):

1. Broadband Manager. The BM will be a Full Time Employee (FTE) and be responsible for the day-to-day requirements/responsibilities of the broadband division. The Broadband Manager will report to the General Manager
   He/she will:
   a. Be the liaison to the ISP community ensuring their needs are taken care of
   b. Own the relationship with the wireless carrer
   c. Ensure broadband division works in concert with the electric company on planning, designing and constructing the joint use network
   d. Provide input into price and packages

e. Manage a team of broadband focused staff
f. Be the community champion and liaison for broadband including working with the CAB or other similar entities
g. Develop and own the Detailed Business Plan
h. Secure and work with contractors during construction phases

2. Engineering Manager
    a. Design engineers desired network for both last mile and middle mile sections
    b. Ensure network is built according to specifications
    c. Documents all network elements in GIS and written format
    d. Provide cost estimates for construction
    e. Works with contractors during construction phases
    f. Provides day-to-day operations support of physical network
    g. Engineers and envisions future network uses
    h. May need the help of an inside plant engineer and an outside plant engineer
3. Sales and Marketing Manager
    a. Owns and promotes LUD paradigm
    b. Reviews and establishes current and future price and package considerations
    c. Helps to identify fiberhoods
    d. Works with these fiberhoods to help them understand the process
    e. Works with local lending institutions for participation in the LUD process
    f. Creates and maintains the company's broadband website
    g. Works with the Broadband Manager on any ISP related events/issues
    h. Identifies and targets new uses for broadband in the community including anchor institutions
    i. Provides support for local ISP's
4. Administrative Support Specialist
    a. Provides billing and accounting functions
    b. Helps all other department managers with various administrative tasks

The Executive Team will be made up of the Broadband Manager, General Manager and the Commissioners.

LUD/Fiberhood Model

In the model similar to LUD/Fiberhood, the PUD would retain all the functions listed above, but would need to augment that with a few additional potential positions. Additional positions could include:

1. Network Manager.
    a. Responsibility for all daily network management ensuring the network is performing as intended
    b. Issue repair tickets for problem resolution
    c. Train and advise ISP on network topology and function as required
    d. Manage any lit services that may be offered
    e. Facilitates end user's change in ISP selection
    f. Monitors all network traffic
    g. Ensures the network is secure
    h. Manages all VPN's, IP address assignments and Service Level Agreements

After hours network management can be contracted with NoaNet or like entity.

2. Wireless Network Engineer (Could be a contract position)
    a. Designs and manages the fixed wireless network components

CHAPTER 6

Broadband Infrastructure Expansion Modeling

BROADBAND SOLUTIONS

Based on the findings of the survey, interviews, due diligence, and other feedback, Magellan concurs that there is indeed demand for better, more affordable, and reliable broadband options. CenturyLink is the incumbent carrier for the region, and even though they secure funding through the FCC for much of the region, their service is not satisfactory to many. Wave, being a competitive carrier, will focus on area of the greatest profit, and neglect regions that are less profitable.

Magellan recommends that Jefferson PUD facilitate the deployment of broadband to a broader area using a combination of the following two models:

a. Wireless Carrier Partnership
b. Hybrid Fiber/Fixed Wireless patterned loosely after Mason 3 PUD, Kitsap PUD and Ammon Idaho, to name a few.

Each of these models have their strengths, weaknesses and opportunities. Each has a different risk assessment associated with it and needs to be measured and agreed upon by the Commissioners and PUD management teams.

Stated Goals

This multidimensional plan recognizes the need to meet several of JPUD's goals, including:

- Capitalize on existing infrastructure and make excess capacity available to the community
- Broadband solutions should be affordable, reliable and forward looking
- Fiber is the primary technology where less capital intensive, fixed wireless is a solution when fiber is cost prohibitive
- Fiber will deliver up-to 1Gbps/1Gbps service (upgradeable as technology improves over time)
- Fixed Wireless should deliver 25Mbps/3Mbps (25 megabits up/3 megabits down)
- Business model cannot put undo financial burdens on existing electrical utility
- Model must be revenue neutral or profitable over an agreed upon timeframe. Profits can be reinvested back into network improvements

- Priority target areas may be those that are unserved (no broadband) or underserved, those with broadband not meeting speed, reliability, cost or latency benchmarks
- Markets will include residential, business and anchor institutions
- Business plan/model should position the PUD to qualify for and receive potential grant funds as they become available over time
- Network must be an Open Access Network

Deployment

There are three general focus areas when planning a broadband deployment:

- Internal Logistics – Management structure, financing, marketing, engineering etc.
- Network Logistics – Capital Costs
  - Shared network assets – backbone fiber, network management hardware and current facilities to deliver lit services
  - Middle mile builds (fiber from the backbone reaching out to each fiberhood, wireless tower or other required customer
  - Last mile considerations including fiberhood definition, last mile costs associated with each subscriber whether it be fiber or fixed wireless
- Operating Costs – Network management structure, staffing, internet access, interest (on borrowed funds) customer support

Each of these sections will be addressed in this Plan and recommendations will be made to support the chosen business model options. Based on the ultimate model selected for implementation, there will be some differences in management structure, engineering, marketing, pricing, operating costs and financial resources required.

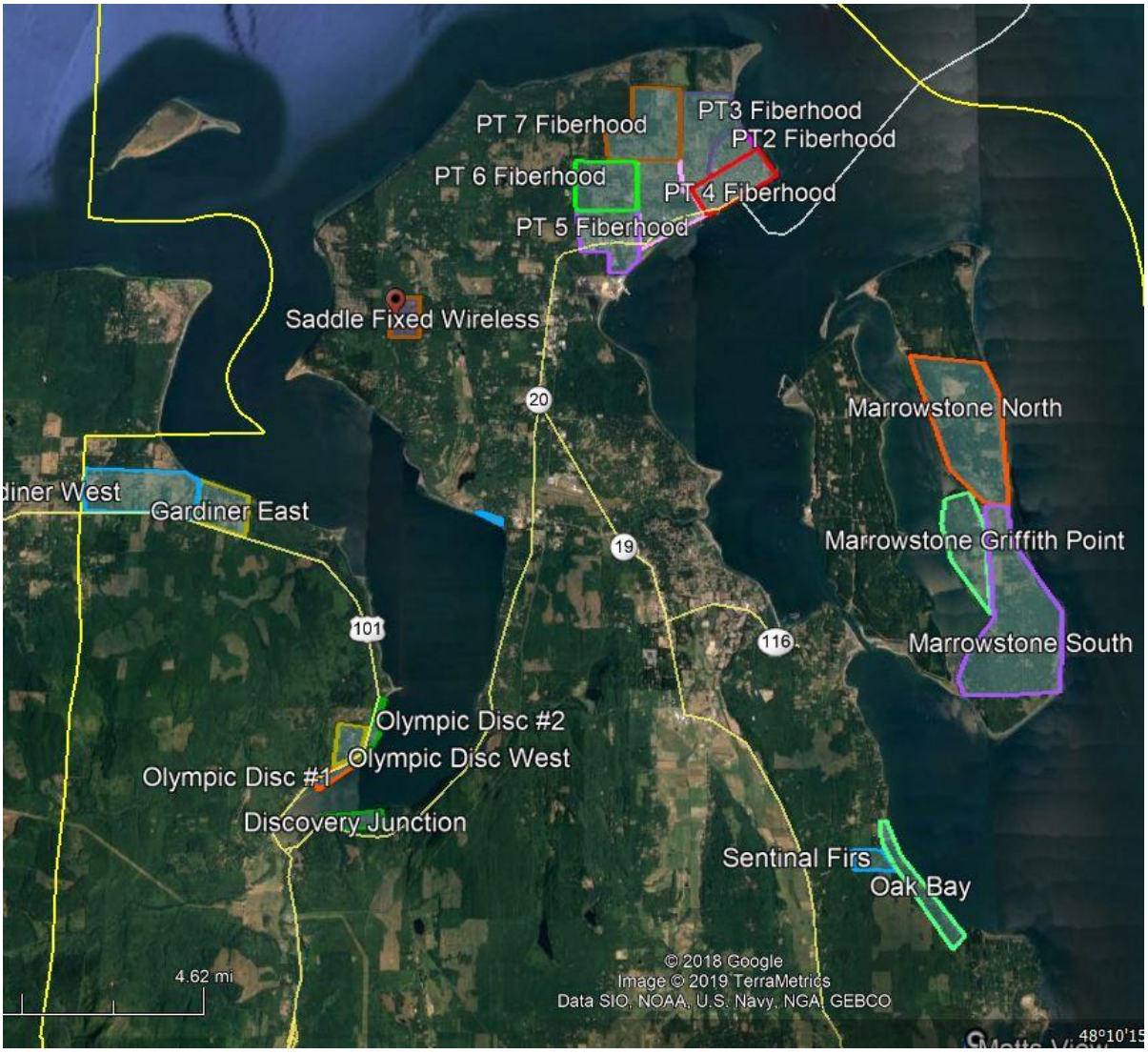
Fiberhood Examples

We have created a few fiberhoods as a representation of how fiberhoods can be defined, engineered, priced and have a positive effect on end user pricing. There are some rather large geographically based fiberhoods, as well as some relatively small ones. Also included is some fixed wireless models for reference. Magellan did not try to blanket the entire service territory with fiberhoods, instead is illustrating how they can be created, priced and defined. It will be the job of the PUD, if they choose to adopt this model, to focus on specific areas of interest based on the techniques outlined earlier in this document. Detailed engineering will have to be facilitated prior to marketing any fiberhoods to the community.

Fiberhood Selection

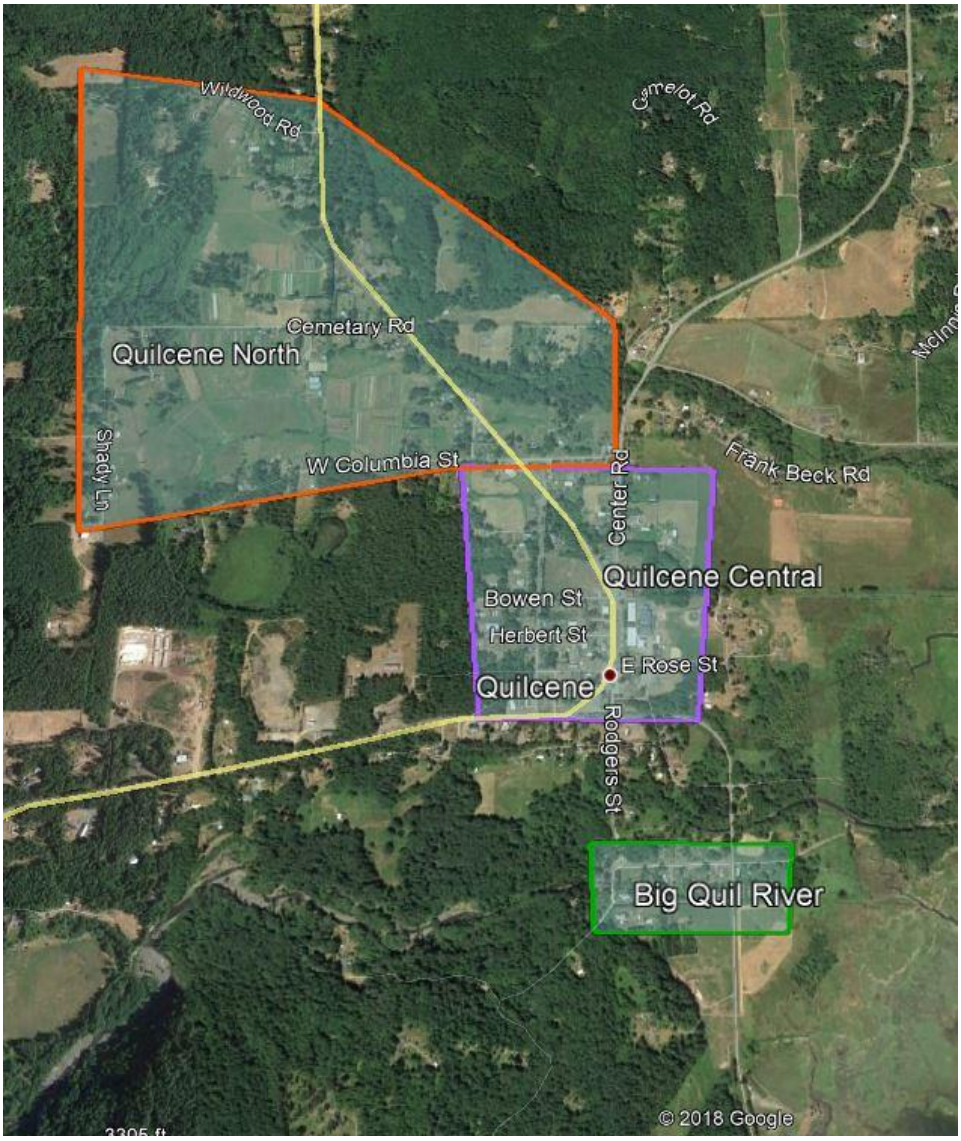
Magellan has identified several fiberhoods as candidates for service. These include smaller communities in rural areas, as well as areas, such as the City of Port Townsend. It is our opinion, regardless of population density, each community should get an opportunity for inclusion in a fiberhood. We also attempted to create fiberhoods where there was expressed demand through the online survey and in locations in close proximity to existing fiber assets.

Figure 6-1. Fiberhoods in the North County



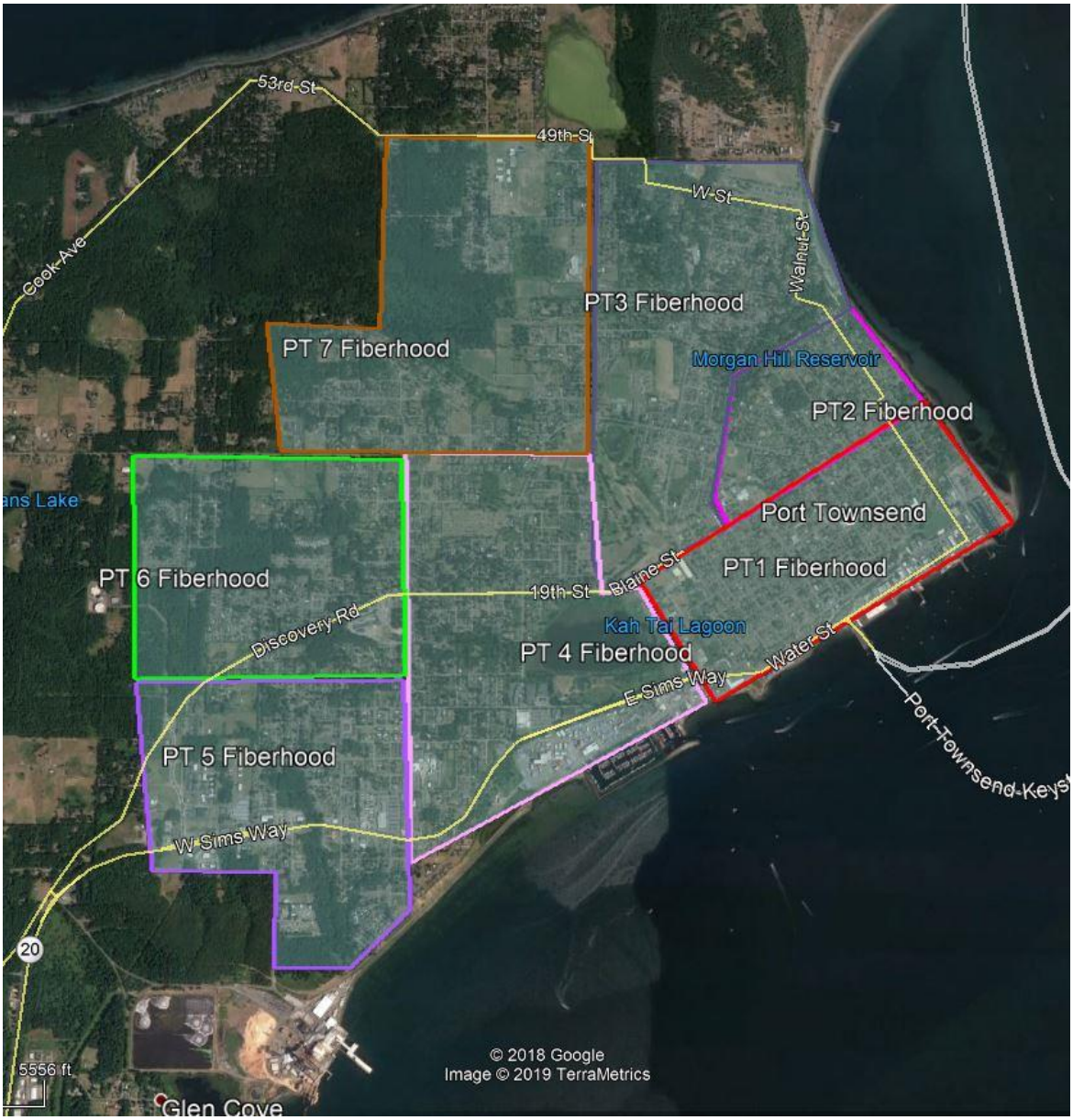
The map above shows the north end of the service territory. There are 18 different fiberhoods in this part of the county.

Figure 6-2. Fiberhoods in the Quilcene Area



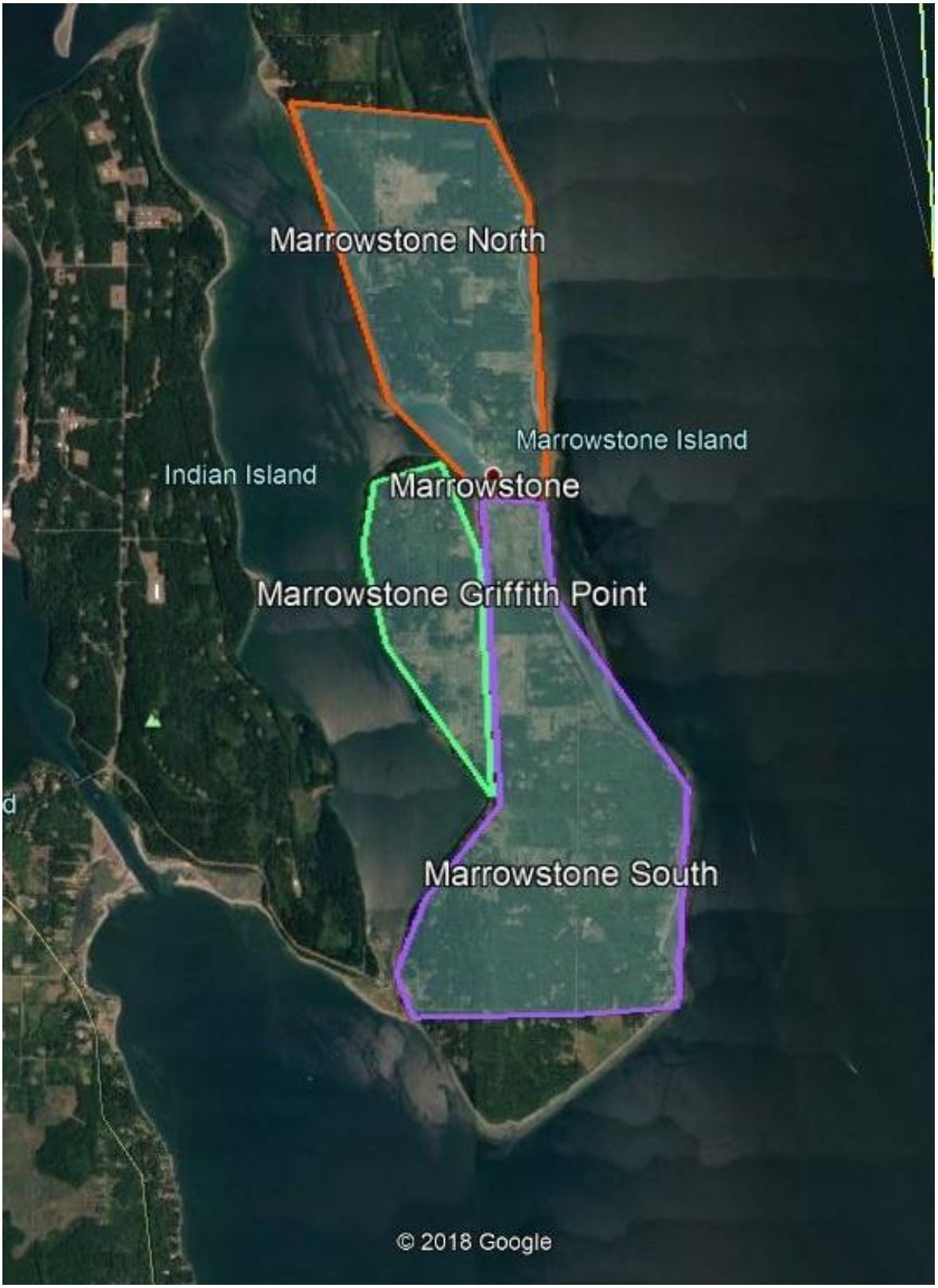
The map above shows fiberhoods created for the Quilcene area.

Figure 6-3. Fiberhoods in Port Townsend



The map above displays a close up of the Port Townsend fiberhoods.

Figure 6-4. Marrowstone Fiberhoods



The map above shows Marrowstone fiberhoods.

Figure 6-5. Potential Fixed Wireless Area

The map above displays the area where fixed wireless may be the best solution.

Modeling Example for Fiberhoods

When defining these fiberhoods for possible inclusion in the program, several considerations should be taken into account including:

- End user price – includes $65 MRC + their share of middle and last mile costs, financed over 180 months. Those costs are determined by detailed engineering prior to presenting to the target group.
- Proxmity to existing fiber assets
- Reasonableness of keeping between $80-$90 MRC

Figure 6-6. Fiberhood PT1 (Port Townsend Area 1) and Cost Estimate

Middle Mile	
Total Feet	35100
Cost Per Ft	$25.00
Total MM	$877,500
Subscribers	
Total Potential	496
% Commitment	70%
Total Sub	348
Subscriber Share	**$2,522**
Last Mile	$1,250
Total Sub Share	**$3,772**
Finance Term	180
End User Share	**$20.95**
PUD	$40.00
ISP	$25.00
Total Price	**$85.95**

The end users would need to commit to an MRC of $85.95 for their 1Gbps/1Gbps service after all the shared infrastructure costs are incorporation.

Figure 6-7. Marrowstone Griffith Fiberhood and Cost Estimate

Middle Mile	
Total Feet	8770
Cost Per Ft	$18.00
Total MM	$157,860
Subscribers	
Total Potential	58
% Commitment	70%
Total Sub	40.6
Subscriber Share	**$3,888**
Last Mile	$1,500
Total Sub Share	**$5,388**
Finance Term	180
End User Share	**$29.93**
PUD	$40.00
ISP	$25.00
Total Price	**$94.93**

Marrowstone Griffith end users will have a $94.93 MRC requirement.

Figure 6-8. Fiberhood PT2 (Port Townsend) Cost Estimate

Port Townsend #2	
Middle Mile	
Total Feet	13846
Cost Per Ft	$25.00
Total MM	$346,150
Subscribers	
Total Potential	255
% Commitment	70%
Total Sub	178.5
Subscriber Share	**$1,939**
Last Mile	$1,250
Total Sub Share	**$3,189**
Finance Term	180
End User Share	**$17.72**
PUD	$40.00
ISP	$25.00
Total Price	**$82.72**

Figure 6-9. Fiberhood PT3 (Port Townsend) Cost Estimate

Port Townsend #3	
Middle Mile	
Total Feet	22545
Cost Per Ft	$25.00
Total MM	$563,625
Subscribers	
Total Potential	350
% Commitment	70%
Total Sub	245
Subscriber Share	**$2,301**
Last Mile	$1,250
Total Sub Share	**$3,551**
Finance Term	180
End User Share	**$19.73**
PUD	$40.00
ISP	$25.00
Total Price	**$84.73**

Figure 6-10. Central Quilcene Fiberhood Estimated Cost

Central Quilcene	
Middle Mile	
Total Feet	0
Cost Per Ft	$0.00
Total MM	$0
Subscribers	
Total Potential	50
% Commitment	70%
Total Sub	35
Subscriber Share	**$0**
Last Mile	$1,500
Total Sub Share	**$1,500**
Finance Term	180
End User Share	**$8.33**
PUD	$40.00
ISP	$25.00
Total Price	**$73.33**

These are examples of how these fiberhoods are derived and the associated end user pricing. The other models show end user pricing in the range of $71 - $104 MRC, all inclusive.

CHAPTER 7

Financial Analysis

FINANCIAL ASSUMPTIONS

Financial modeling allows us to predict and calculate possible financial outcomes based on research-derived assumptions that are then run through modeling software. Assumptions are subjective in nature but are based on expert real-world experience applied to the local market. Magellan has developed assumptions based on our own experience with similar models and tailored them to Jefferson PUD's network, assets, and potential business model.

The model allows us to "turn the dials" and test the financial impact of different scenarios. For instance, we can test different values for take-rate or subscriber numbers to see the impact on the overall financial picture. We can also use the model to demonstrate best case vs worst case scenarios.

There are several buckets of assumptions behind the model. Common input fields that have the most impact include:

1. Take Rate – How many subscribers will sign up for the service.
2. Ramp Rate – Of those we think will ultimately sign up for service, how long it will take for them to actually enroll. There is generally a lag time between when the network is available for service and when users will sign up.
3. End user packages and pricing – Determining the optimal competitive, affordable end user pricing the PUD is going to offer. If the price is too high, it affects the ultimate number of subscribers. If it is too low, we leave money on the table and may not be able to make a profit, although we may get more subscribers.
4. Residential vs Commercial vs "Other" revenue generation opportunities – The degree to which each of these "buckets" of revenue contributes to the overall revenue.
5. Capital Costs – What capital is needed and when to enable the PUD to facilitate the proposed business plan. Some capital costs are needed upfront in preparation of offering service, whereas other capital costs are on a per-subscriber basis. Other capital costs may be required as future upgrades due to changes in technology.
6. Operating Expenses – These are comprised of several considerations, including:
    1. *Staffing.* Based on the proposed business model, JPUD must hire staff appropriate to support those models. Staffing costs are comprehensive and tailored to the region, with allowances for cost of living changes. We also include partial headcounts when an FTE is not needed or can be

shared with the electric utility. This may be the case in administration, engineering, communications, billing, other areas.

2. *Internet Access.* A rather large monthly fee is for internet access that will support the aggregated local traffic out to the internet.
3. *Marketing and Sales Costs*
4. *Legal, accounting, utility and other overhead costs*
5. *Interest expense*
6. *Network Management contract expense*

ASSUMPTIONS FOR THE FIBERHOOD APPROACH

Support for the **Hybrid LUD/Fiberhood** approach include:

Take Rate/Ramp

- 2000 total residential subscribers ramped up over a 10-year period
- 60 Total business subscribers ramped over a 6-year period

Pricing

- $40 MRC Net to PUD for all residential subscribers
- Business Packages include:

Figure 7-1. Business Service Offerings and Pricing

Service Class	Service Type	Price (Monthly Recurring Cost)	% of Subscribers
Business	1 Gb best effort	$100	70%
	100 Mbps best effort	$80	10%
	1 Gb Direct Internet Access (DIA)	$1,295	10%
	100 Mbps Direct Internet Access (DIA)	$600	10%

Capital Costs

- $1,190,000 for headend equipment to provide Lit Services in year 1
- $350,000 in network upgrades in year 6
- All other network costs will be billed as part of the fiberhood approach, or can be built by the electric utility for their internal purposes, or the PUD can look to joint build or secure grant funds

- All existing capital costs (assets) are owned by the electric utility

Operating Expenses

- Staffing – Model calls for 4 FTE in the first few years, ramping up as business ramps up, then down as business matures
- Network Management – Assumed $10 MRC per sub. Negotiable
- Overhead – Roughly $50k per year
- Internet Access $180,000 per year

Interest Expense

- Borrowing $1.19M at 2.5% interest for 20 years. Pays for the headend equipment

The figure below displays a summary of the financial results when these assumptions are applied to modeling.

Figure 7-2. Financial Summary

Figure 7-3. Cumulative Unrestricted Free Cash Flow

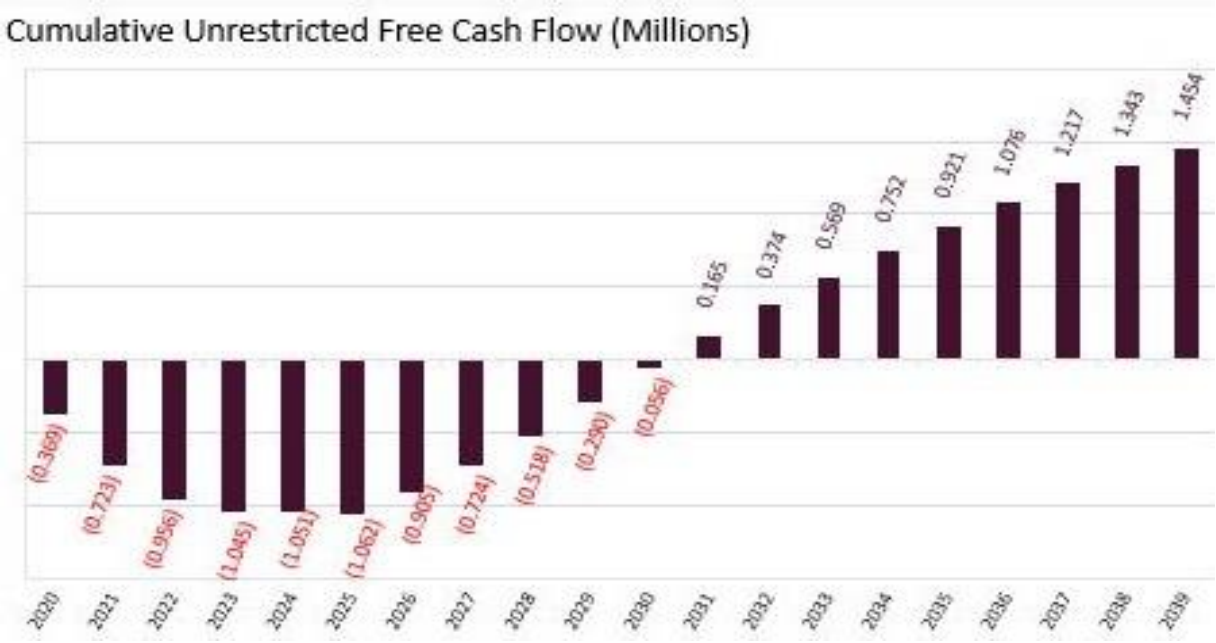


Figure 7-4. Annual Unrestricted Free Cash Flow

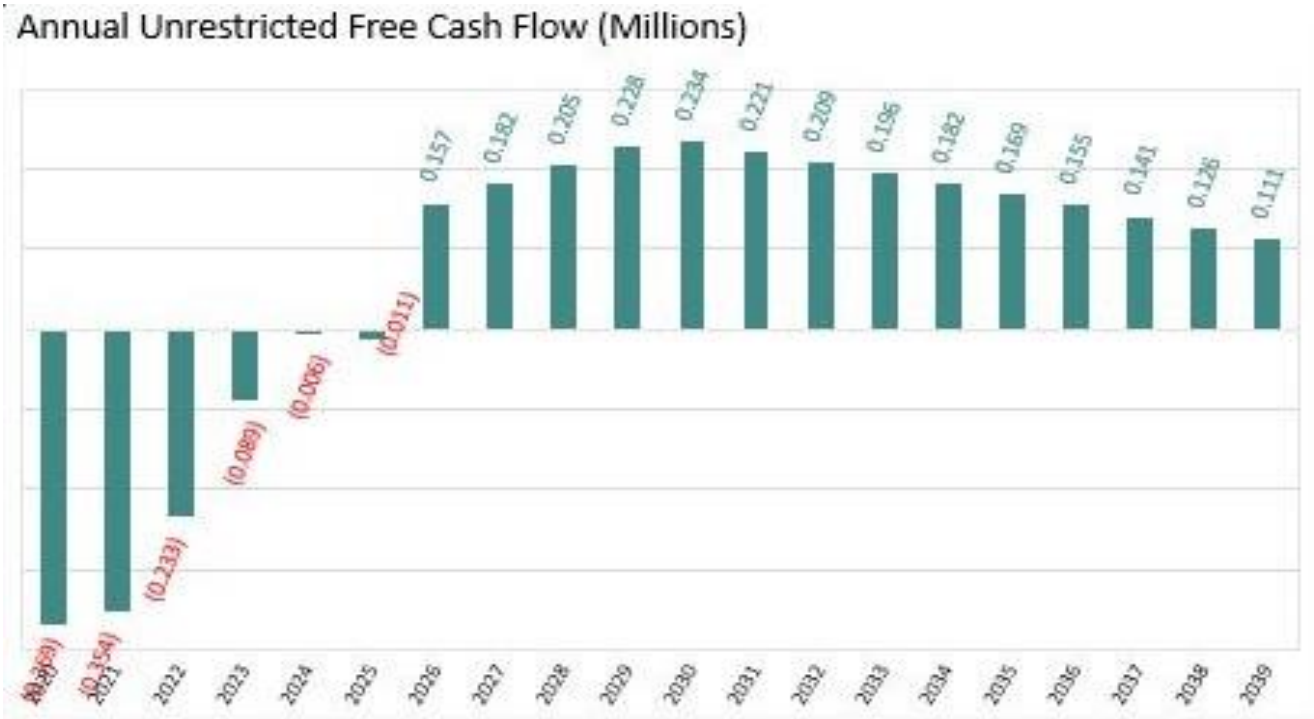


Figure 7-5. EBITDA & Net Income

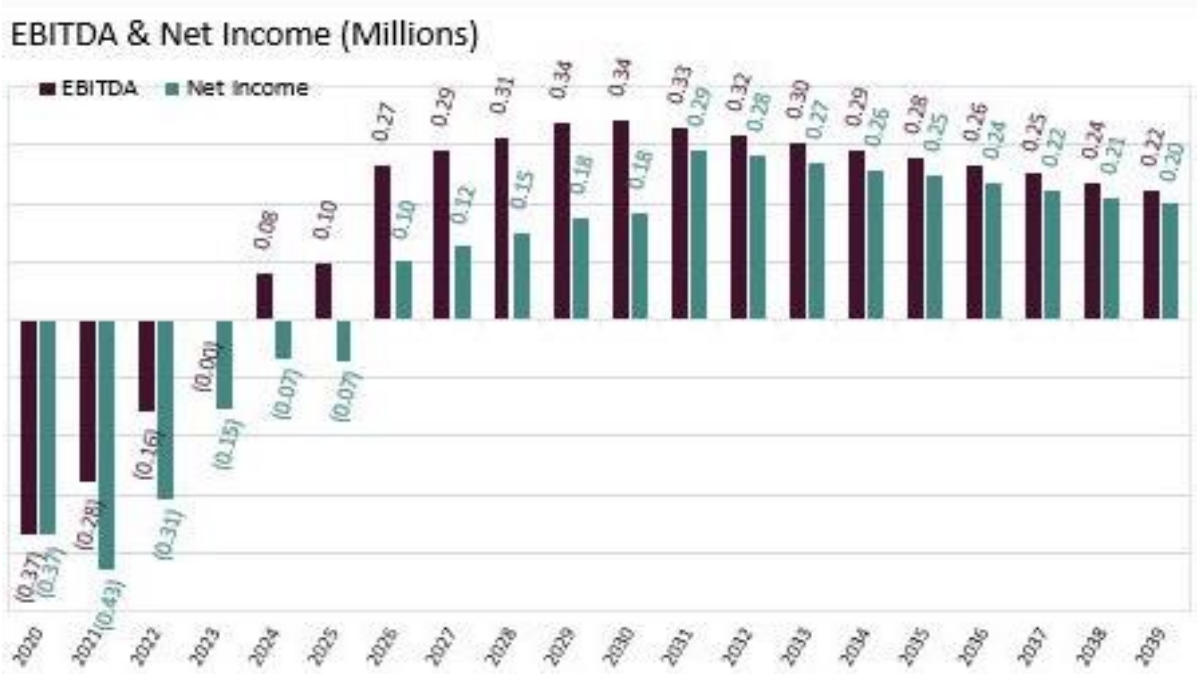


Figure 7-6. Debt Balance

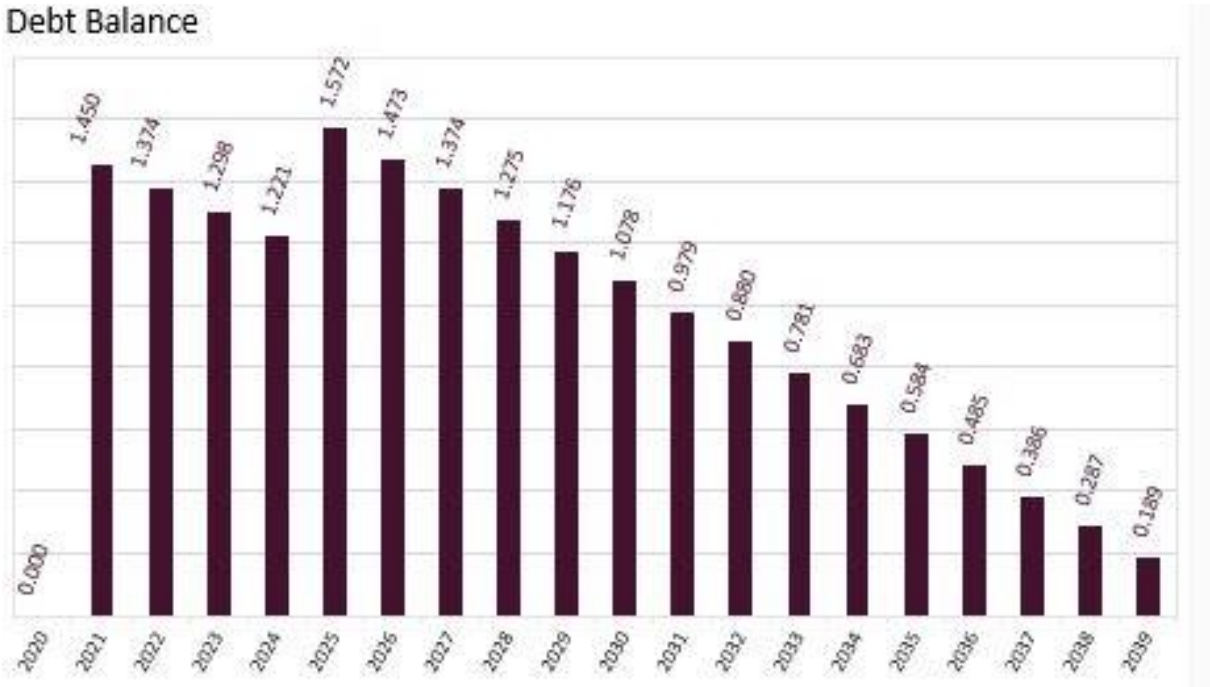


Figure 7-7. Total Reserve Balances and Profit Margins

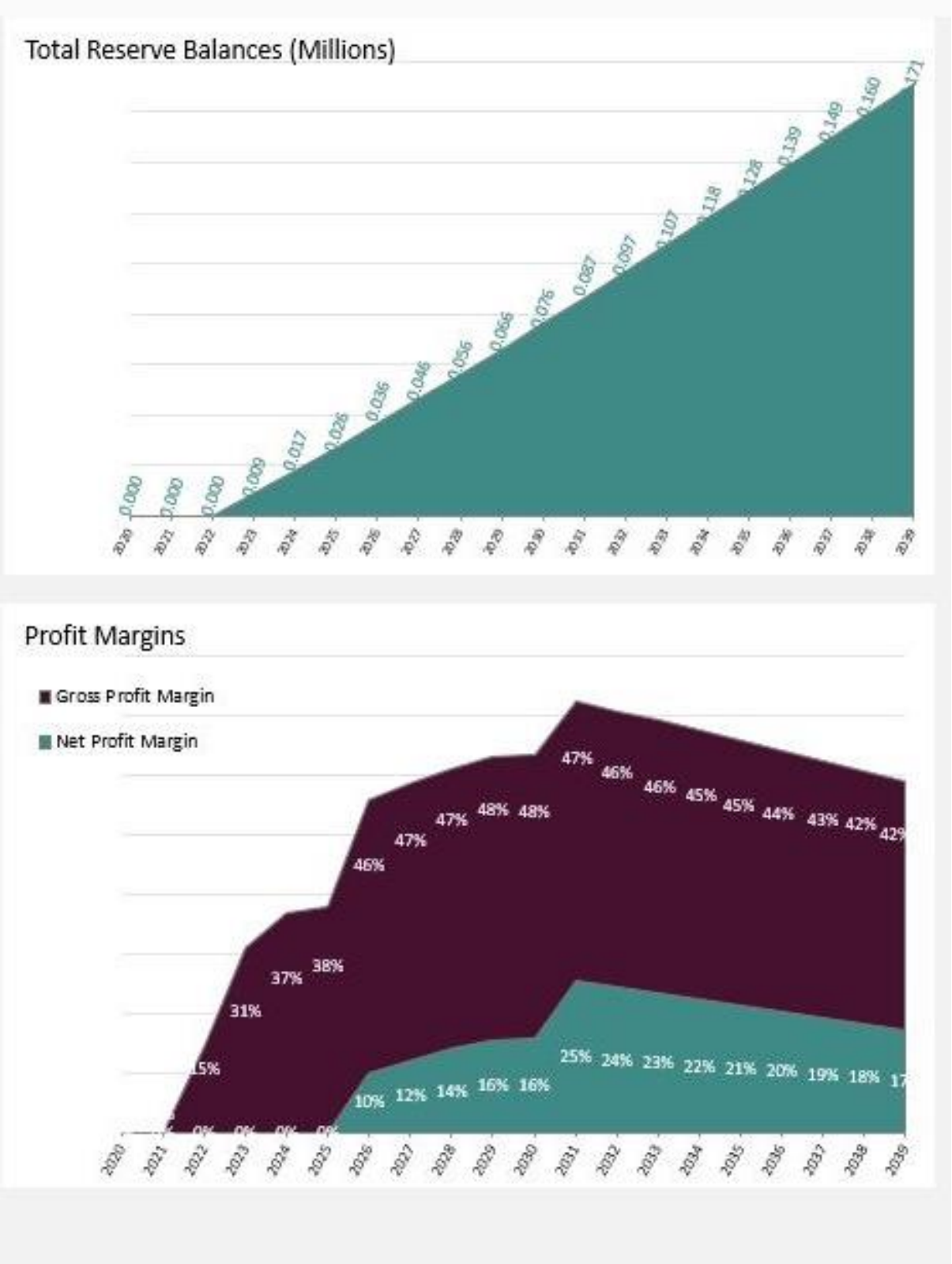
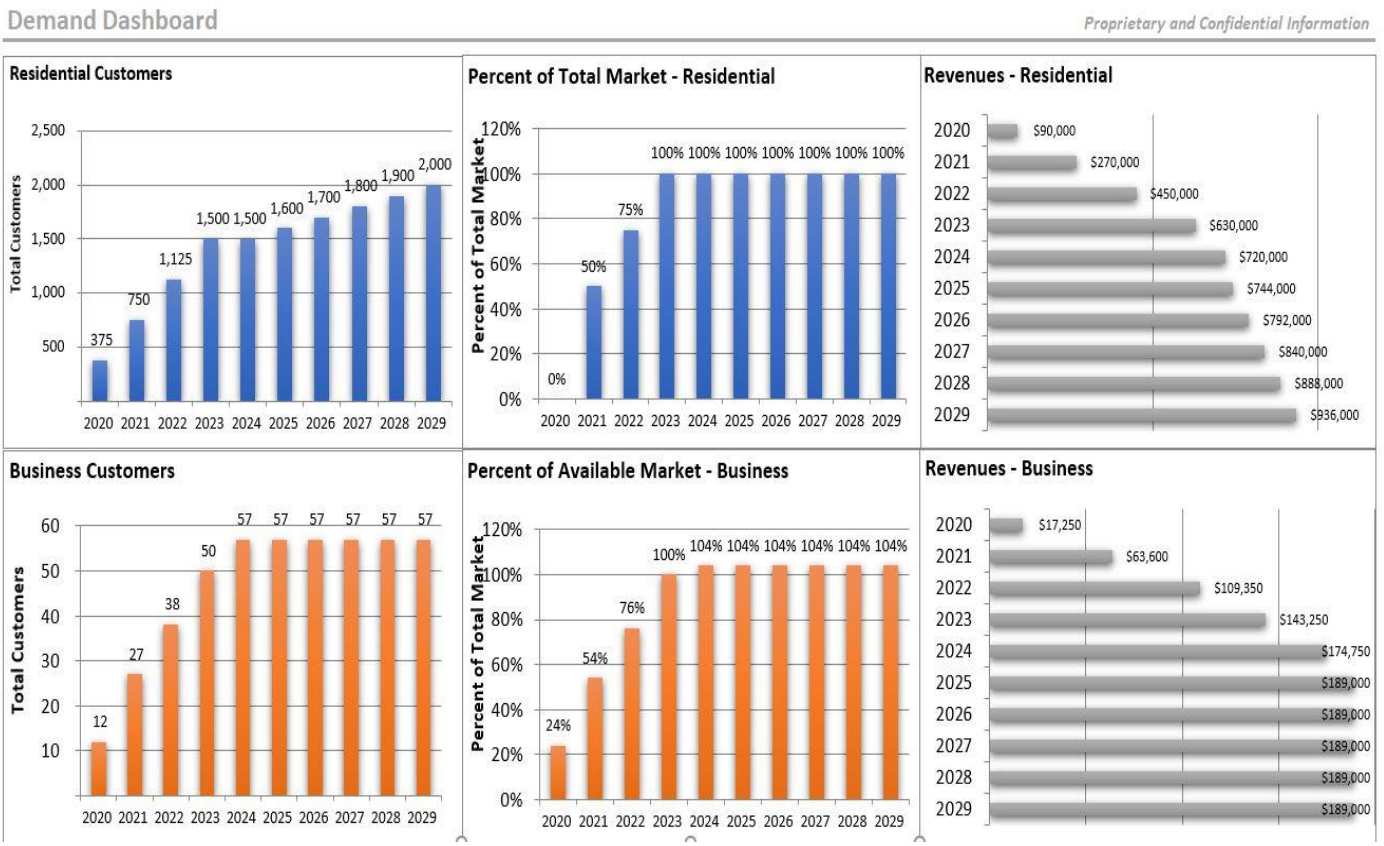


Figure 7-8. Demand Metrics



Conclusion

While profitability is relatively low, this approach does not put the electric utility at undo risk of financial harm if it is managed properly and expectations are met. Out of the over 22,000 homes and businesses (26,000 meters) in the region, it is reasonable that the PUD, over time, can capture up to 2,000 subscribers, which is less than 10% of the market. Any additional subscribers will only improve the bottom line. For instance, if the PUD were to capture 3,000 subscribers instead of 2,000, accumulated revenue at the end of 20 years would be $5.3M, an increase of $4M to the bottom line.

The model capitalizes on the existing assets of the power company to help offset the cost of providing broadband at a relatively affordable of about $80-$90 per month.

The $30 net revenue to the PUD is challenging and is highly susceptible to fluctuations in take rate and subscriber retention. Whether the community responds to the proposed business plan is still to be determined, but given the results of the outreach performed, it is likely that many residents and businesses will at least consider switching. Experience tells us that it can take quite some time for a community to agree to the conditions of the fiberhood and, given that JPUD has fixed expenses,

regardless of number of users, the lag time can have a significant impact on the overall financial picture. The early years of the model will require investment by the PUD until such time as the subscribers are enough to cover costs and pay down that investment.

The community must be engaged and committed to such a model, or it will fail to live up to expectations. JPUD must convey why the costs and end user prices are set as they are. Many may ask for a less expensive service, but that would be difficult given the cost structure and market dynamics for this region. It is the same reason why they do not have robust broadband today.

WIRELESS CARRIER PARTNERSHIP APPROACH

This version of the draft report does not yet include financial modeling for the potential partnership since the terms of such a partnership would determine financial outlook. The selection of a partner and negotiation of terms could be pursued by JPUD through a selective bidding process via RFP, during which financial projections could be calculated.

GRANT FUNDING OPPORTUNITIES

To fund the network, JPUD may be able to secure grant funding or loans through federal and state programs. While this landscape is ever-evolving, this section contains information about some of the grant opportunities that may be available to JPUD. Comprehensive details about federal grant and loan programs including eligibility requirements, application processes, and use of funds can be found in **Appendix B.**

USDA-RUS Reconnect Loan and Grant Program

The $600 million USDA-RUS Reconnect grant and loan funding opportunity, announced in December 2018, targets funding to the lowest density rural communities in the U.S., and prioritizes awards in states with a broadband plan updated within the last five years and policies that promote streamlined, low-cost access to rights of way.

Funding is available only for rural communities where at least 90% of the serving area is unserved with 10/1 Mbps broadband, and only in communities not previously funded by an RUS broadband loan, state broadband award, or an FCC Connect America Fund reverse auction subsidy – unless the awardee of the funding is the applicant. Only Viasat received an FCC reverse auction award in 2018, and only for satellite broadband service.

Rural area census blocks of JPUD's service areas that are at least 90% unserved with 10/1 Mbps service today would be eligible for funding, but it would be necessary to identify the exact locations of these census blocks and ensure that they meet all of the eligibility requirements. The PUD would have to be able to make a sustainable

business case with revenues from the unserved census blocks, which would most likely be located outside the towns already served by Comcast, CenturyLink and the satellite broadband providers.

The program's scoring criteria awards 25 points for proposed serving areas with a population density of 6 or less, calculated by dividing total population by square mileage of the proposed serving area. Points are also awarded for the numbers of farms, businesses, schools, rural healthcare providers/pharmacies, and critical community facilities in eligible areas that pre-commit to broadband service subscriptions.

The USDA-RUS Electric Program also provides low cost loans to deploy fiber-optic Smart Grid networks to the meter. RUS allows the use of the Smart Grid network to provision broadband service to electric customers. USDA-RUS encourages its electric borrowers to leverage their Smart Grid networks to offer broadband service in rural areas.

USDA-RUS receives $5 billion a year in appropriation funding for electric system loans. There are no requirements to serve broadband only to unserved census blocks in the electric serving area, and no cap on loan size. The loans have a fixed interest rate for a 30 to 35-year maturity. The interest rate is pegged to the constant maturity rate ("CMT") of the 30-year Treasury bond each time funds are drawn for deployment. The CMT rate fluctuates, but rates have ranged from less than 2% to over 3% in the last year. RUS will allow borrowers to defer principal payment during construction.

Debt service for a RUS loan compared to debt service on municipal bonds for a $22 million Smart Grid network can save over $11 million in debt service payments over a 20-year period, and make the difference between sustainability and infeasibility in a rural broadband business plan.

RUS will also allow for a "short option" maturity, for example a 30-day maturity, with a lower rate than the 30-year CMT. A 30-day loan will automatically roll over at the end of the 30-day term at no charge. By choosing a short option maturity, a borrower can continue to roll over the note every 30 days at no charge, significantly lowering the interest rate below the 30-year CMT, but the borrower may fix the interest rate at the then current 30-year CMT at the end of any 30-day rollover period.

Where allowable by state law, electric cooperatives and electric cities around the U.S. are tapping into Electric Program loans for Smart Grid networks for load management and outage management of their electric distributions systems, and at the same time offering broadband services to diversify and increase their electric service revenue base. Their customers can receive symmetrical 100 Mbps to Gigabit Service and higher, and the system will attract new businesses to the area to increase economic

development. Customers have the added advantage of controlling their energy usage remotely and/or automatically through Internet-enabled apps for energy management.

JPUD is a member of the National Rural Electric Cooperative Associate (NRECA) and plans to become a member of the National Rural Economic Development Association (NREDA), which will allow them to stay connected with the progress of the program. JPUD could apply if an experienced service provider partner entered into a binding commitment with the County to provide the required services.

Other Federal Funding Sources:

Most federal broadband infrastructure grant and loan funding available today is authorized to USDA Rural Development and Rural Utilities Service programs. Assuming a business case can be made, there are smaller grant opportunities of $2 million per award to connect an unserved rural community.

Funds are authorized to the Department of Commerce Economic Development Administration for communities affected by sudden events such as a natural disaster, a military base closing, or loss of a major employer, but the funding available is less than the amount authorized to the USDA programs, and there are restrictions on where infrastructure may be placed. For example, for a county applicant, infrastructure must be placed only in County rights of way. Additional funding would have to be found to deploy fiber from the county's right of way to the premise.

Areas affected by natural disasters such as hurricanes and wildfires have access to funding for infrastructure resiliency, to bury electric and communications lines, but these funds have primarily been available through the Economic Development Administration. Community Development Block Grants from the Department of Housing and Urban Development have been targeted to housing for displaced residents in disaster affected communities.

Further detailed evaluation of federal funding sources can be located in **Appendix B** of this Plan.

State Funding

Without forward looking policies and greater investment in infrastructure grant and loan funding by the federal government, states and local governments must look to their own resources, innovative partnerships and policy support to promote Gigabit service for all.

Washington Senate Bill 5511, which creates a Statewide Broadband Office and dedicates funding to expand affordable, resilient broadband service to enable economic development, public safety, healthcare, and education, was signed into law on May 13, 2019. Creation of the office allows the authority to set statewide policy

and promote private investment and adds Washington to a growing list of states with offices dedicated to expanding internet availability.

The legislation includes a $1.2 million plan to create an office devoted to building out broadband internet access across the state. also calls for $25 million in bonds and grants for broadband infrastructure upgrades in rural parts of Washington, to be administered by the state's Public Works Board.

Tax Advantaged Investment Funding

JPUD may be able to work with other public agencies such as EDC Team Jefferson to access funding. Jefferson County may have access to Tax advantaged Investment funding created by state law, which could be used for broadband infrastructure investment. Investment in the County's Opportunity Zones (Port Townsend, Hadlock Marrowstone, Hoh Brinnon, Clallum Bay Ozette, Forks, Quillayute, and Angeles Industrial) would offer tax incentives to investors, which can be "stacked" on top of incentives provided by other tax advantaged investments.

CHAPTER 8

Action Plan

PLANNING FOR A SUCCESSFUL BROADBAND SERVICE OFFERING

Delivering broadband to an end consumer is different than delivering other utility services including water, sewer or even power. However, there are also some similarities that make entering the broadband service business paradigm approachable for utilities. Jefferson PUD should consider the following recommendations for entering the new business venture of delivering broadband:

1. **Understand your market and end user requirements**. Each market's broadband requirements are different. Some communities have robust residential opportunities but lack strong commercial or business customers, while others may be just the opposite. Jefferson County has a need for more robust broadband in both the residential and commercial markets. The speeds and services they require will dictate the network design, requirements and costs. The communities' price sensitivities also influence the network services offered and the ultimate return-on-investment.
2. **Be forward looking**. Building and delivering an appropriate broadband solution will require a long-term commitment and strategy supported by the community, management, and the Board. Building networks can take several years. Look to deploy technologies that will be long-lasting and easily upgradeable as user requirements and expectations change over time. What is acceptable today may not be in the later years of the build. Plan accordingly.
3. **Vest the community in the solution**. Given that Jefferson PUD is not a for-profit company, it will need to work closely with the community to help them understand that they are part of the solution. They need to commit to subscribe, finance some last-mile infrastructure, and champion the offering to others in the community. JPUD will need to establish some ongoing outreach programs and efforts to help the community understand their role in the success of the project.
4. **Capitalize on the strengths of the electric company.** The electric utility has assets in place and is planning new assets that should be used to help augment the cost of delivering broadband. JPUD has facilities, fiber, towers and vertical assets, power, and financial resources that can be used to greatly reduce the cost of a typical deployment. Initial broadband services should be targeted at locations where fiber and other assets already exist.

As the electric utility looks to expand and upgrade its network, it should do so with broadband considerations taken into account.

5. **Broadband planning and thinking should permeate the organization**. Delivering and supporting broadband is not for the casual management team. Leadership must support and drive broadband efforts through all levels of the organization including planning, engineering, construction, finance, customer support, ISP outreach, marketing, and staffing. The culture of the existing organization will change and managing that change will be a key to the success of broadband efforts. Everyone should know their role and expectations for supporting the effort and its benefit to the company and the community.
6. **Learn from others**. There are plenty of experienced utility providers delivering broadband to end users. Some have very different approaches, while others seem to follow some relatively similar business practices. Each utility provider understands their own strengths and weaknesses as well as the needs and challenges of delivering a solution to meet those needs. Capitalize on the experience of others and tailor it to JPUD's circumstances. Collaborate with others as much as possible including other local PUD's and cooperatives, the community, and other government organizations with interest in delivering broadband.

CREATING A BROADBAND COMPANY

Below are the next steps JPUD should take toward addressing the broadband issues in its community:

1. **Commissioners ratify this Broadband Feasibility Study When Completed.** Commissioners' ratification provides staff with approval to implement these recommendations and move forward with this Plan. This ratification would also include supporting the costs/resources associated with the next implementation steps.
2. **Assign staff and resources.** Resources should be assigned with specific responsibilities to drive these recommendations. Staff should consider hiring a full-time broadband manager focused specifically on the creation of a Detailed Business Plan. This report details the attributes and skill sets required of a broadband manager and can be referenced when searching for an appropriate person. Magellan can provide detailed job specifications and salaries and wages upon request.
3. **Create a Detailed Business Plan**. This Infrastructure Expansion Plan provides guidance, direction, and recommendations on how JPUD can deliver broadband to the community through capitalizing on their assets, organizational structure, and position within the region. A formal Business Plan covering detailed items such as exact end user pricing and service

offerings, marketing and sales strategies, prioritized target markets, financing and accounting, and staffing assignments is the next level of executable detail required to move forward. This step includes the development of partnerships with wireless carriers through a competitive bidding process. Terms of such a partnership should be negotiated with JPUD's financial goals in mind.

4. **Get the Detailed Business Plan approved by staff and commissioners.** The Detailed Business Plan will provide in-depth detail about every aspect of the broadband business. This Plan will establish the new entity with the ability to accept and apply for grant funding, attract ISPs, and to start building a broadband network in a cohesive and prioritized manner in preparation for delivering services.

Appendix A. Glossary

3G – Third Generation	The third generation of mobile broadband technology, used by smart phones, tablets, and other mobile devices to access the web.
4G – Fourth Generation	The fourth generation of mobile broadband technology, used by smart phones, tablets, and other mobile devices to access the web.
ADSL – Asymmetric Digital Subscriber Line	DSL service with a larger portion of the capacity devoted to downstream communications, less to upstream. Typically thought of as a residential service.
ADSS – All-Dieletric Self-Supporting	A type of optical fiber cable that contains no conductive metal elements.
AMR/AMI – Automatic Meter Reading/Advanced Metering Infrastructure	Electrical meters that measure more than simple consumption and an associated communication network to report the measurements.
ATM – Asynchronous Transfer Mode	A data service offering that can be used for interconnection of customer's LAN. ATM provides service from 1 Mbps to 145 Mbps utilizing Cell Relay Packets.
Bandwidth	The amount of data transmitted in a given amount of time; usually measured in bits per second, kilobits per second (kbps), and Megabits per second (Mbps).
Bit	A single unit of data, either a one or a zero. In the world of broadband, bits are used to refer to the amount of transmitted data. A kilobit (Kb) is approximately 1,000 bits. A Megabit (Mb) is approximately 1,000,000 bits. There are 8 bits in a byte (which is the unit used to measure storage space), therefore a 1 Mbps connection takes about 8 seconds to transfer 1 megabyte of data (about the size of a typical digital camera photo).
BPL – Broadband over Powerline	A technology that provides broadband service over existing electrical power lines.
BPON – Broadband Passive Optical Network	BPON is a point-to-multipoint fiber-lean architecture network system which uses passive splitters to deliver signals to multiple users. Instead of running a separate strand of fiber from the CO to every customer, BPON uses a single strand of fiber to serve up to 32 subscribers.
Broadband	A descriptive term for evolving digital technologies that provide consumers with integrated access to voice, high-speed data service, video-demand services, and interactive delivery services (e.g. DSL, Cable Internet).
CAD – Computer Aided Design	The use of computer systems to assist in the creation, modification, analysis, or optimization of a design.
CAI – Community Anchor Institutions	The National Telecommunications and Information Administration defined CAIs in its SBDD program as "Schools, libraries, medical and healthcare providers, public safety entities, community colleges and other institutions of higher education, and other community support organizations and entities". Universities, colleges, community colleges, K-12 schools, libraries, health care facilities, social service providers, public safety entities, government and municipal offices are all community anchor institutions.
CAP – Competitive Access Provider	(or "Bypass Carrier") A Company that provides network links between the customer and the Inter-Exchange Carrier or even directly to the Internet Service Provider. CAPs operate private networks independent of Local Exchange Carriers.

Cellular	A mobile communications system that uses a combination of radio transmission and conventional telephone switching to permit telephone communications to and from mobile users within a specified area.
CLEC – Competitive Local Exchange Carrier	Wireline service provider that is authorized under state and Federal rules to compete with ILECs to provide local telephone service. CLECs provide telephone services in one of three ways or a combination thereof: 1) by building or rebuilding telecommunications facilities of their own, 2) by leasing capacity from another local telephone company (typically an ILEC) and reselling it, and 3) by leasing discrete parts of the ILEC network referred to as UNEs.
CO – Central Office	A circuit switch where the phone lines in a geographical area come together, usually housed in a small building.
Coaxial Cable	A type of cable that can carry large amounts of bandwidth over long distances. Cable TV and cable modem service both utilize this technology.
CPE – Customer Premise Equipment	Any terminal and associated equipment located at a subscriber's premises and connected with a carrier's telecommunication channel at the demarcation point ("demarc").
CWDM – Coarse Wavelength Division Multiplexing	A technology similar to DWDM only utilizing less wavelengths in a more customer-facing application whereby less bandwidth is required per fiber.
Demarcation Point (“demarc”)	The point at which the public switched telephone network ends and connects with the customer's on-premises wiring.
Dial-Up	A technology that provides customers with access to the Internet over an existing telephone line.
DLEC – Data Local Exchange Carrier	DLECs deliver high-speed access to the Internet, not voice. Examples of DLECs include Covad, Northpoint and Rhythms.
Downstream	Data flowing from the Internet to a computer (Surfing the net, getting E-mail, downloading a file).
DSL – Digital Subscriber Line	The use of a copper telephone line to deliver “always on” broadband Internet service.
DSLAM – Digital Subscriber Line Access Multiplier	A piece of technology installed at a telephone company’s Central Office (CO) and connects the carrier to the subscriber loop (and ultimately the customer’s PC).
DWDM – Dense Wavelength Division Multiplexing	An optical technology used to increase bandwidth over existing fiber-optic networks. DWDM works by combining and transmitting multiple signals simultaneously at different wavelengths on the same fiber. In effect, one fiber is transformed into multiple virtual fibers.
E-Rate	A Federal program that provides subsidy for voice and data circuits as well as internal network connections to qualified schools and libraries. The subsidy is based on a percentage designated by the FCC.
EON – Ethernet Optical Network	The use of Ethernet LAN packets running over a fiber network.
EvDO – Evolution Data Only	EvDO is a wireless technology that provides data connections that are 10 times as fast as a traditional modem. This has been overtaken by 4G LTE.

FCC – Federal Communications Commission	A Federal regulatory agency that is responsible for regulating interstate and international communications by radio, television, wire, satellite and cable in all 50 states, the District of Rock Falls, and U.S. territories.
FDH – Fiber Distribution Hub	A connection and distribution point for optical fiber cables.
FTTN – Fiber to the Neighborhood	A hybrid network architecture involving optical fiber from the carrier network, terminating in a neighborhood cabinet with converts the signal from optical to electrical.
FTTP – Fiber to the premise (or FTTB – Fiber to the building)	A fiber-optic system that connects directly from the carrier network to the user premises.
GIS – Geographic Information Systems	A system designed to capture, store, manipulate, analyze, manage, and present all types of geographical data.
GPON- Gigabit-Capable Passive Optical Network	Similar to BPON, GPON allows for greater bandwidth through the use of a faster approach (up to 2.5 Gbps in current products) than BPON.
GPS – Global Positioning System	a space-based satellite navigation system that provides location and time information in all weather conditions, anywhere on or near the Earth where there is an unobstructed line of sight to four or more GPS satellites.
GSM – Global System for Mobile Communications	This is the current radio/telephone standard developed in Europe and implemented globally except in Japan and South Korea.
HD – High Definition (Video)	Video of substantially higher resolution than standard definition.
HFC – Hybrid Fiber Coaxial	An outside plant distribution cabling concept employing both fiber-optic and coaxial cable.
ICT – Information and Communications Technology	Often used as an extended synonym for information technology (IT), but it is more specific term that stresses the role of unified communications and the integration of telecommunications, computers as well as necessary enterprise software, middleware, storage, and audio-visual systems, which enable users to access, store, transmit, and manipulate information.
IEEE – Institute of Electrical Engineers	A professional association headquartered in New York City that is dedicated to advancing technological innovation and excellence.
ILEC – Incumbent Local Exchange Carrier	The traditional wireline telephone service providers within defined geographic areas. Prior to 1996, ILECs operated as monopolies having exclusive right and responsibility for providing local and local toll telephone service within LATAs.
IP-VPN – Internet Protocol-Virtual Private Network	A software-defined network offering the appearance, functionality, and usefulness of a dedicated private network.
ISDN – Integrated Services Digital Network	An alternative method to simultaneously carry voice, data, and other traffic, using the switched telephone network.
ISP – Internet Service Provider	A company providing Internet access to consumers and businesses, acting as a bridge between customer (end-user) and infrastructure owners for dial-up, cable modem and DSL services.
ITS – Intelligent Traffic System	Advanced applications which, without embodying intelligence as such, aim to provide innovative services relating to different modes of transport and traffic management and enable various users to be better informed and make safer, more coordinated, and 'smarter' use of transport networks.
Kbps – Kilobits per second	1,000 bits per second. A measure of how fast data can be transmitted.

LAN – Local Area Network	A geographically localized network consisting of both hardware and software. The network can link workstations within a building or multiple computers with a single wireless Internet connection.
LATA – Local Access and Transport Areas	A geographic area within a divested Regional Bell Operating Company is permitted to offer exchange telecommunications and exchange access service. Calls between LATAs are often thought of as long distance service. Calls within a LATA (IntraLATA) typically include local and local toll services.
Local Loop	A generic term for the connection between the customer's premises (home, office, etc.) and the provider's serving central office. Historically, this has been a copper wire connection; but in many areas it has transitioned to fiber optic. Also, wireless options are increasingly available for local loop capacity.
MAN – Metropolitan Area Network	A high-speed intra-City network that links multiple locations with a campus, City or LATA. A MAN typically extends as far as 30 miles.
Mbps – Megabits per second	1,000,000 bits per second. A measure of how fast data can be transmitted.
MPLS – Multiprotocol Label Switching	A mechanism in high-performance telecommunications networks that directs data from one network node to the next based on short path labels rather than long network addresses, avoiding complex lookups in a routing table.
ONT – Optical Network Terminal	Used to terminate the fiber-optic line, demultiplex the signal into its component parts (voice telephone, television, and Internet), and provide power to customer telephones.
Overbuilding	The practice of building excess capacity. In this context, it involves investment in additional infrastructure projects to provide competition.
OVS – Open Video Systems	OVS is a new option for those looking to offer cable television service outside the current framework of traditional regulation. It would allow more flexibility in providing service by reducing the build out requirements of new carriers.
PON – Passive Optical Network	A Passive Optical Network consists of an optical line terminator located at the Central Office and a set of associated optical network terminals located at the customer's premise. Between them lies the optical distribution network comprised of fibers and passive splitters or couplers. In a PON network, a single piece of fiber can be run from the serving exchange out to a subdivision or office park, and then individual fiber strands to each building or serving equipment can be split from the main fiber using passive splitters / couplers. This allows for an expensive piece of fiber cable from the exchange to the customer to be shared amongst many customers, thereby dramatically lowering the overall costs of deployment for fiber to the business (FTTB) or fiber to the home (FTTH) applications.
PPP – Public-Private Partnership	A Public–Private Partnership (PPP) is a government service or private business venture that is funded and operated through a collaborative partnership between a government and one or more private sector organizations. In addition to being referred to as a PPP, they are sometimes called a P3, or P^3.
QOS – Quality of Service	QoS (Quality of Service) refers to a broad collection of networking technologies and techniques. The goal of QoS is to provide guarantees on the ability of a network to deliver predictable results, which are reflected in Service Level Agreements or SLAs. Elements of network performance within the scope of QoS often include availability (uptime), bandwidth (throughput), latency (delay), and error rate. QoS involves prioritization of network traffic.
RF – Radio Frequency	a rate of oscillation in the range of about 3 kHz to 300 GHz, which corresponds to the frequency of radio waves, and the alternating currents which carry radio signals.

Right-of-Way	A legal right of passage over land owned by another. Carriers and service providers must obtain right-of-way to dig trenches or plant poles for cable systems, and to place wireless antennae.
RMS – Resource Management System	A system used to track telecommunications assets.
RPR – Resilient Packet Ring	Also known as IEEE 802.17, is a protocol standard designed for the optimized transport of data traffic over optical fiber ring networks.
RUS – Rural Utility Service	A division of the United States Department of Agriculture, it promotes universal service in unserved and underserved areas of the country with grants, loans, and financing. Formerly known as "REA" or the Rural Electrification Administration.
SCADA – Supervisory Control and Data Acquisition	A type of industrial control system (ICS). Industrial control systems are computer controlled systems that monitor and control industrial processes that exist in the physical world.
SNMP – Simple Network Management Protocol	An Internet-standard protocol for managing devices on IP networks.
SONET – Synchronous Optical Network	A family of fiber-optic transmission rates.
Steaming	Streamed data is any information/data that is delivered from a server to a host where the data represents information that must be delivered in real time. This could be video, audio, graphics, slide shows, web tours, combinations of these, or any other real time application.
Subscribership	Subscribership is how many customers have subscribed for a particular telecommunications service.
Switched Network	A domestic telecommunications network usually accessed by telephone, key telephone systems, private branch exchange trunks, and data arrangements.
T-1 – Trunk Level 1	A digital transmission link with a total signaling speed of 1.544 Mbps. It is a standard for digital transmission in North America.
T-3 – Trunk Level 3	28 T1 lines or 44.736 Mbps.
UNE – Unbundled Network Element	Leased portions of a carrier's (typically an ILEC's) network used by another carrier to provide service to customers. Over time, the obligation to provide UNEs has been greatly narrowed, such that the most common UNE now is the UNE-Loop.
Universal Service	The idea of providing every home in the United States with basic telephone service.
Upstream	Data flowing from your computer to the Internet (sending E-mail, uploading a file).
UPS – Uninterruptable Power Supply	An electrical apparatus that provides emergency power to a load when the input power source, typically main power, fails.
USAC – Universal Service Administrative Company	An independent American nonprofit corporation designated as the administrator of the Federal Universal Service Fund (USF) by the Federal Communications Commission.
VDSL – Very High Data Rate Digital Subscriber Line	A developing digital subscriber line (DSL) technology providing data transmission faster than ADSL over a single flat untwisted or twisted pair of copper wires (up to 52 Mbit/s downstream and 16 Mbit/s upstream), and on coaxial cable (up to

	85 Mbit/s down and upstream); using the frequency band from 25 kHz to 12 MHz.
Video on Demand	A service that allows users to remotely choose a movie from a digital library whenever they like and be able to pause, fast-forward, and rewind their selection.
VLAN – Virtual Local Area Network	In computer networking, a single layer-2 network may be partitioned to create multiple distinct broadcast domains, which are mutually isolated so that packets can only pass between them via one or more routers; such a domain is referred to as a Virtual Local Area Network, Virtual LAN or VLAN.
VoIP – Voice over Internet Protocol	An application that employs a data network (using a broadband connection) to transmit voice conversations using Internet Protocol.
VPN – Virtual Private Network	A virtual private network (VPN) extends a private network across a public network, such as the Internet. It enables a computer to send and receive data across shared or public networks as if it were directly connected to the private network, while benefitting from the functionality, security and management policies of the private network. This is done by establishing a virtual point-to-point connection through the use of dedicated connections, encryption, or a combination of the two.
WAN – Wide Area Network	A network that covers a broad area (i.e., any telecommunications network that links across metropolitan, regional, or national boundaries) using private or public network transports.
WiFi	WiFi is a popular technology that allows an electronic device to exchange data or connect to the Internet wirelessly using radio waves. The Wi-Fi Alliance defines Wi-Fi as any "wireless local area network (WLAN) products that are based on the Institute of Electrical and Electronics Engineers' (IEEE) 802.11 standards".
WiMax	WiMax is a wireless technology that provides high-throughput broadband connections over long distances. WiMax can be used for a number of applications, including “last mile” broadband connections, hotspot and cellular backhaul, and high speed enterprise connectivity for businesses.
Wireless	Telephone service transmitted via cellular, PCS, satellite, or other technologies that do not require the telephone to be connected to a land-based line.
Wireless Internet	1) Internet applications and access using mobile devices such as cell phones and palm devices. 2) Broadband Internet service provided via wireless connection, such as satellite or tower transmitters.
Wireline	Service based on infrastructure on or near the ground, such as copper telephone wires or coaxial cable underground or on telephone poles.

Appendix B. Detailed Federal Funding Opportunities

With the conclusion of the grant and loan awards established by the American Recovery and Reinvestment Act of 2009 (P.L. 111-5), two primary sources of ongoing federal funding for broadband infrastructure remain:

- The Rural Utilities Service (RUS) Telecommunications Program of the U.S. Department of Agriculture for Broadband Network infrastructure and the RUS Electric Program for Electric Smart Grid Networks, and
- The Universal Service Fund (USF) program under the Federal Communications Commission (FCC).

In addition to regular fiscal year appropriations to USDA-RUS, the Farm Bill appropriates and structures funding for broadband infrastructure and broadband-enabled services for rural areas. The Farm Bill must be reauthorized by Congress approximately every five years,

Other sources of funding may include Congressional appropriations to the U.S. Department of Commerce for Public Works and Economic Adjustment grants to areas impacted by unexpected events, including extreme weather events, military base closings, and closure or downsizing of major employer facilities. The Department of Housing and Urban Development (HUD) may allocate funding from appropriations for support in disaster affected areas to infrastructure resiliency projects to bury electric and communications lines.

Other funding for broadband infrastructure and services may be appropriated to the Institute for Science and Museum Services, the Department of Transportation, the Defense Department, the Department of Military Construction and Veterans Affairs, the Department of Health and Human Services and other federal agencies.

FISCAL YEAR 2019 REGULAR APPROPRIATIONS

Five of the FY2019 regular appropriations bills have been enacted as of 12/16/2018:

- Department of Defense Appropriations Act, 2019;
- Energy and Water Development and Related Agencies Appropriations Act, 2019;
- Departments of Labor, Health and Human Services, and Education, and Related Agencies Appropriations Act, 2019;
- Legislative Branch Appropriations Act, 2019; and
- Military Construction, Veterans Affairs, and Related Agencies Appropriations Act, 2019.

Appropriations for rural water and wastewater systems grants and loans may be leveraged with grant funding from USDA-RUS to co-locate underground conduit and fiber-optic cable with the water systems financed.

Defense funding includes $20 million for infrastructure modernization in areas outside of military bases.

Subsidy requests from the Rural Healthcare program of the Department of Health and Human Services have exceeded funding levels in recent years, creating challenges for private sector providers to feasibly offer broadband services for rural healthcare.

Regular Appropriations Bills Not Yet Enacted as of 12/16/2018

(Continuing Resolutions in place through 12/21/2018)

- Agriculture
- Commerce
- Justice
- Science
- Financial Services & General Government
- Homeland Security
- Interior
- Environment
- State
- Foreign Operations
- Transportation
- Housing and Urban Development (HUD)

Congress must continue to extend Continuing Resolutions for these agencies in order to avoid expiration of funding, which would result in a shutdown of non-essential functions and furloughs of non-essential personnel.

Farm Bill Reauthorization

The Farm Bill must be reauthorized by Congress every five years. Funding for the Farm Bill lapsed when Congress allowed the Bill to expire in 2018 without a Continuing Resolution. The Farm Bill reauthorization, known as the 2018 Agriculture Improvement Act, was signed into law in December 2018.

Title VI of the Act appropriates funding for Rural Development, of which the Rural Utilities Services is a part. Key provisions of Title VI are as follows:

- *Sec. 6101. Combating substance use disorder in rural America.* This section creates a 20 percent set-aside of financial assistance and prioritizes telemedicine projects aimed at addressing the opioid crisis.
- *Sec. 6102. Distance learning and telemedicine.* The Farm Bill increases annual authorizations for the Distance Learning and Telemedicine Program from $75 million to $82 million a year.
- *Sec. 6201. Access to broadband telecommunications services in rural areas.* This section expands the federal resources for broadband investments to include grants (in addition to the loan and loan guarantee programs already available).
- *Sec. 6202. Expansion of middle mile infrastructure into rural areas.* This section allows counties to use USDA broadband loans and grants for middle-mile projects prohibited under current law.
- *Sec. 6214. Rural broadband integration working group.* This section creates a federal advisory committee that is required to work with state, local, tribal and territorial governments, telecommunications companies, utilities, trade associations, philanthropic entities, policy experts and other interested parties to identify, assess and determine possible actions relating to barriers and opportunities for broadband deployment in rural areas.
- *Sec. 6301. Exclusion of Certain Populations from Definition of Rural Area.* This section would allow counties with regional jails to exclude incarcerated individuals from population caps for funding eligibility under USDA Rural Development programs.

- *Sec. 6306. Council on Rural Community Innovation and Economic Development.* Much like the previous administration's White House Rural Council, this section creates a federal interagency council to coordinate the development of policy recommendations, maximize the impact of federal investment on rural communities, promote economic prosperity and quality of life in rural communities and use innovation to resolve local and regional challenges faced by rural communities.
- *Sec. 6401. Strategic economic and community development.* This section of the package expands the Strategic Economic and Community Development program to allow the U.S. Secretary of Agriculture to prioritize funding for projects that support the implementation of a strategic community development plan that encompasses two or more jurisdictions
- *Sec. 6424. Rural innovation stronger economy grant program.* This section creates a new Rural Innovation Stronger Economy (RISE) grant program, which would help counties strengthen local economies through job accelerator partnerships with the private sector and institutions of higher education.
- *Sec. 6507. Cybersecurity and grid security improvements.* This section of the package authorizes the Secretary of Agriculture to make loans or loan guarantees available to communities for cybersecurity and grid security improvements.

It is important to note that the Farm Bill authorizes funding for allowable purposes and determines general requirements, but the specific requirements applicable to each funding opportunity will be announced at the time the Notice of Funding Availability is released by the authorizing agency. The initial rules for E-Connectivity funding appropriated in FY 2018 were recently announced by RUS, but detailed rules are still being developed and are expected to be released in the near future.

CONTINUING RESOLUTIONS FOR FY 2018 APPROPRIATIONS FUNDING

Continuing resolutions under the Consolidated Appropriations Act, 2018 (P.L. 115-141) appropriated $5 million to subsidize a broadband loan level of $29.851 million; $30 million to the Community Connect broadband grant program; $29 million for the Distance Learning and Telemedicine grant program; and $0.863 million in loan subsidies for a total loan level of $690 million for the Telecommunications Infrastructure Loan and Loan Guarantee Program.

P.L. 115-141 also appropriated $600 million to RUS to conduct a new broadband loan and grant E-Connectivity pilot program known as the ReConnect program. Initial program rules follow, with final rules expected to be released in the near future.

- Ninety percent of the households served by any project funded through this program must be unserved or underserved with 10 Mbps broadband downstream and 1 Mbps upstream
- Any entity receiving funds from the program is prohibited from overbuilding an existing RUS borrower.
- No more than 4% of funds received through the program can be used towards administrative costs.

FY 2018 APPROPRIATIONS FOR THE U.S. DEPARTMENT OF COMMERCE

P.L. 115-141 appropriated $7.5 million to the National Telecommunications and Information Administration to update the national broadband availability map in coordination with the FCC. In

addition, the Act contains provisions to facilitate deployment of broadband infrastructure on federal property, as well as making more spectrum available for wireless broadband.

CONNECT AMERICA FUND

The FCC's USF High Cost Fund is undergoing a major transition to the Connect America Fund (CAF), which is targeted to the deployment, adoption, and utilization of both fixed and mobile broadband.

Since 2015, the CAF program has provided over $19 billion in funding to the ten largest telephone carriers in the U.S., including Frontier Communications and CenturyLink, and over 700 rural local telephone companies throughout the U.S., to provide a minimum of 10 Mbps downstream and 1 Mbps upstream broadband service and telephone service to unserved rural areas. The culmination of the CAF program's multi-year funding program was a "reverse auction" held on July 24, 2018 to award $1.98 billion in subsidies to any qualified providers, including cable and internet service providers, offering to provide the minimum service level at the lowest cost to remaining unserved areas.

A list of companies applying for FCC qualification to participate in the auction was published prior to the auction opening.

The results of the CAF Reverse Auction may be found at the following link:

https://www.fcc.gov/reports-research/maps/caf2-auction903-results

The FCC's CAF program is described in more detail in a later section of this report.

OTHER FEDERAL FUNDING SOURCES:

Private Sector Tax Incentives:

- New Markets Tax Credits
- State-Designated Opportunity Zones

Bills Supporting Broadband Infrastructure Introduced in 115th Congress

As this Congress has considered options for accelerating broadband infrastructure deployment, a key issue has been how to provide federal assistance for unserved and underserved areas where the private sector is not providing acceptable service levels, while at the same time minimizing the impact of government intervention on competition and private sector investment.

156 bills supporting broadband infrastructure deployment or incorporating provisions for broadband service for specific purposes were introduced in the 115th Congress from 2017 to 2018 to date, but only 20 of the bills gained traction. Four appropriations bills were passed by the House and Senate and signed into law. The Farm Bill reauthorization was passed by the House and the Senate but is still in reconciliation to resolve differences in the House and Senate versions before the bill is sent to the White House for signature. The remaining 15 bills were passed by the House or the Senate, but not both. Of the 15 bills, those with recent action may still advance and be passed into law, but the remaining bills have either died in committee or been superceded by other bills.

With increasing bipartisan support from members of Congress from rural states for broadband infrastructure funding and public policies to remove barriers, the two underlying reasons why there are still unserved areas in the U.S. today are: 1) internal rate of return thresholds for private sector investments; and 2) politics. Funding and policy support for broadband deployment in hard to serve rural areas may increase in 2019.

FEDERAL FUNDING SOURCES

United States Department of Agriculture (USDA)

Rural Development

USDA Rural Development is committed to improving the economy and quality of life in Rural America. Rural Development has a multi-billion-dollar loan portfolio and administers billions in loans, loan guarantees, and grants through its programs. Rural Development helps rural individuals, communities and businesses obtain needed financial and technical assistance to address diverse and unique needs through specific programs.

Rural Development programs support such essential public facilities and services as water and wastewater disposal systems, housing, health clinics, emergency service facilities, electric service and telephone/broadband communications service. Rural Development promotes economic development by supporting loans to businesses through banks, credit unions and community-managed lending pools. It offers technical assistance and information to help agricultural producers and cooperatives get started and improve the effectiveness of their operations. In addition, Rural Development provides technical assistance to help communities undertake empowerment programs.

Rural Utilities Service

USDA's Rural Utilities Service (RUS) administers programs that provide much-needed infrastructure or infrastructure improvements to rural communities. These include water and waste treatment, electric power, and telecommunications and broadband services. All of these services play a critical role in helping to expand economic opportunities and improve the quality of life for rural residents.

Utilities programs connect rural residents to the global economy by:

1. Increasing access to broadband and 21st century telecommunications services;
2. Funding sustainable renewable energy development and conservation;
3. Financing reliable and affordable electric systems;
4. Working to integrate electric smart grid technologies;
5. Developing reliable and affordable rural water and wastewater systems.

These investments support the nation's long-term prosperity by ensuring that rural communities have the infrastructure to compete in the global economy.

Programs Administered by the Rural Utilities Service (RUS)

1. Rural Broadband Access Loan and Loan Guarantee Program

This program was created under the 2002 Farm Bill and subsequent reauthorizations. The program provides funding for projects that offer Broadband Service at or beyond a specific Broadband Lending Speed defined by RUS. Through this program, rural consumers can benefit from the same quality and range of broadband services that are available in urban and suburban communities.

Definition of Broadband: Definitions affecting eligibility are required to be revised by RUS from time to time and published in the Federal Register**.**

> As of May 1, 2018 RUS defined "Broadband Service" for both mobile and fixed service as a minimum data transmission rate of 25 megabits/second (Mbps) downstream from the Internet to the consumer's premise, and 3 Mbps upstream from the premise to the Internet (25 Mbps / 3 Mbps).

This data transmission rate defines the presence of Existing Broadband Service, which determines whether an area is eligible for funding. It also defines the "Broadband Lending Speed" as the minimum data transmission rate that applicants for funding must propose to offer for both mobile and fixed service to the customer.

Use of Funds: Financing may be used to fund the costs of construction, improvement and acquisition of broadband facilities; the cost of leasing facilities; the acquisition of existing systems or another company; and the refinancing of existing telecommunications loans.

Eligible Entities: To be eligible for a broadband loan, an applicant may be either a non-profit or for-profit organization, and must take one of the following forms:

- Corporation;
- Limited liability company (LLC);
- Cooperative or mutual organization;
- A state or local unit of government; or
- Indian tribe or tribal organization.

Individuals and Partnerships are not Eligible

Eligible Areas: Proposed service areas to be funded must be completely contained within a rural area or composed of multiple rural areas, defined as any area, as confirmed by the latest decennial census of the Bureau of the Census, which is not located within:

(i) A city, town, or incorporated area that has a population of greater than 20,000 inhabitants; or

(ii) An urbanized area contiguous and adjacent to a city or town that has a population of greater than 50,000 inhabitants. For purposes of the definition of rural area, an urbanized area means a densely populated territory as defined in the latest decennial census of the U.S. Census Bureau.

In addition to population size and location relative to an urbanized area, the following conditions also determine eligibility:

- At least 15 percent of the households in the proposed service area must have no access to Broadband Service.
- No part of the proposed service area may have three or more "incumbent service providers"
- No part of the proposed service area may overlap with the service areas of current RUS borrowers or the service areas of grantees funded by RUS for broadband service.
- Communities where RUS has previously provided funding for construction of broadband infrastructure may not be eligible.

The General Field Representative (GFR) for the RUS Telecommunications Program in the state should be contacted prior to an application for funding to determine the presence of previous RUS loan- or grant-funded broadband infrastructure in the proposed serving area.

Contact information for the RUS State GFR(s) may be found by clicking on the map at the following link:
https://www.rd.usda.gov/contact-us/telecom-gfr

Funding Availability:

Over $100 million is available nationwide for this program.
Minimum Loan Amount: *$100,000*
Maximum Loan Amount: *$10 million*
Eligible applications that propose to serve the highest % of unserved households will receive funding offers first.

Funding Type:

- Direct Cost of Money Loans
- Loan Term limited to the expected composite economic life of the assets to be financed plus 3 years (generally 20 years)
- Fixed Interest Rate equal to U.S. Treasury Yield Curve rates for instruments with comparable maturities (commonly referred to as "Constant Maturity Treasury" rates or "CMTs"). The 30-year Treasury Constant Maturity Rate was 3.14% on December 14, 2018.

- Items of Special Emphasis:
  - Calculation of Additional Cash Requirement
  - Equity Requirement
  - Market Survey
  - Methodology and Assumptions included with Financial Information
  - Audited Financial Statements vs. Unaudited Financial Statements plus Tax Returns

Additional Information:

Code of Federal Regulations: 7 CFR 1738

Website:

https://www.rd.usda.gov/programs-services/farm-bill-broadband-loans-loan-guarantees.

2. Community Connect Broadband Grants Program

The Community Connect Program is a highly competitive grant program providing funding for projects that offer Broadband Service to rural and economically-challenged communities at or beyond the Broadband Grant Speed, which is defined by RUS in the latest publication of the Federal Register. These projects must also provide for two years of free Broadband Service to critical community facilities, such as government buildings, fire stations and libraries. Successful grantees must also provide a community center that offers two years of free Internet access to the public.

Definition of Broadband:

A) *Minimum Broadband Service.* RUS uses this measurement to determine whether a proposed funded service area is served or unserved. Until otherwise revised in the Federal Register, the minimum data transmission rate that qualifies as Minimum Broadband Service is ten (10) megabits per second (Mbps) downstream and one (1) Mbps upstream (written as "10 Mbps / 1 Mbps") for both fixed and mobile broadband service. RUS will determine that Broadband Service does not exist for areas with no broadband access or where access is less than 10 Mbps / 1 Mbps.

B) *Minimum Broadband Grant Speed*. The minimum bandwidth that an applicant must propose to deliver to every customer in the proposed funded service area. Until otherwise

revised in the Federal Register, the minimum data transmission rate that qualifies as Minimum Broadband Grant Speed is 25 Mbps / 3 Mbps for both fixed and mobile service to the customer.

Use of Funds: Construction, acquisition, or leasing of facilities, spectrum, land or buildings used to deploy broadband service for:

- All residential and business customers located within the Proposed Funded Service Area (PFSA).
- All participating critical community facilities (such as public schools, fire stations, and public libraries).
- The cost of providing broadband service free of charge to the critical community facilities for 2 years.
- Up to 10% of the grant may be used for the improvement, expansion, construction, or acquisition of a community center that provides online access to the public, provided that the community center is open and accessible to area residents before, during, and after normal working hours and on Saturday or Sunday.
- All equipment purchased with grant and/or matching funds must be new or nondepreciated.

Eligible Entities:

Applicants must be organized as an incorporated organization, an Indian tribe or tribal organization, a state or local unit of government, or other legal entity, including cooperatives, private corporations or limited liability companies organized on a for profit or not-for profit basis.

Eligible Areas:

- Funds must be used in rural areas that are not located within an urbanized area or a place that has a population of greater than 20,000 inhabitants.
- All the households in the applicant's proposed funded service area must have no access to existing broadband service at the Minimum Broadband Service speed of 10 Mbps / 1 Mbps.
- Grantees must provide matching funds in cash that are equal to at least 15 percent of the requested grant amount.

Funding Availability:

$30 million was authorized to this Program under the Consolidated Appropriations Act of 2018. The 2018 Farm Bill Reauthorization increased funding to $50 million per fiscal year through 2023.

Annual Application Window: Funding Window in 2018 announced in March

Funding window closed May 14, 2018

Minimum Loan Amount: *$100,000*
Maximum Loan Amount: *$3 million*
Matching funds of at least 15% from non-federal sources are required and can be used for operating costs.

Application Scoring:

- Documentation in support of the need for services
- Benefits derived from the proposed services
- Characteristics of the Proposed Funded Service Area (PFSA)

- Local community involvement in project planning and implementation
- Level of experience of the management team

In ranking applications the Agency will consider the following criteria based on a scale of 100 possible points:

(a) An analysis of the challenges of the following criteria, laid out on a community-wide basis, and how the Project proposes to address these issues (up to 50 points):

(1) The economic characteristics;
(2) Educational challenges;
(3) Health care needs; and
(4) Public safety issues;

(b) The extent of the Project's planning, development, and support by local residents, institutions, and Critical Community Facilities. Documentation must include evidence of community-wide involvement, as exemplified by community meetings, public forums, and surveys. In addition, applicants should provide evidence of local residents' participation in the Project planning and development (up to 40 points).

(c) The level of experience and past success of operating broadband systems for the management team. (up to 10 points)

(d) In making a final selection among applications with comparable rankings and geographic distribution, the Administrator of RUS may take into consideration the characteristics of the PFSA. Only information provided in the application will be considered. Applicants should therefore specifically address each of the following criteria to differentiate their applications:

(1) Persistent poverty counties that will be served within the PFSA;
(2) Out-migration Communities that will be served within the PFSA;
(3) The rurality of the PFSA;
(4) The speed of service provided by the project;
(5) Substantially underserved trust areas to be served within the PFSA;
(6) Community members with disabilities to be served within the PFSA;
(7) Any other additional factors that may be outlined in the NOFA.

- Other Requirements:
  - Buildings constructed with grant funds must be located on property owned by the awardee
  - Leasing expenses will only be covered through the advance of funds period included in the award documents
  - Borrowers must have legal authority to provide, construct, operate and maintain the proposed facilities or services
  - Partnerships with other federal, state, local, private, and nonprofit entities are encouraged

Additional Information:

Code of Federal Regulations: 7 CFR Part 1739

Website: https://www.rd.usda.gov/programs-services/community-connect-grants

3. Telecommunications Infrastructure Loan Program

This program provides funding for projects that offer new and improved telephone and broadband service in rural areas. Program financing may be used to fund the costs of construction, improvement, expansion and acquisition of systems or facilities; the acquisition of existing systems or another company; and the refinancing of loans from other lenders.

Use of Funds: Telecommunications service in rural areas. A beneficiary must be a resident of rural areas and others who may also receive telephone service as a result of service provided to a rural area.

Eligible Entities: Most entities that provide or propose to provide telecommunications service in qualified rural areas including:

- State and local governmental entities
- Federally Recognized Tribes
- Non-profits, including Cooperatives, and limited dividend or mutual associations
- For-profit businesses (must be a corporation or limited liability company)

RUS gives preference to those borrowers (including initial loan applicants) already providing telephone service in rural areas, and to cooperative, nonprofit, limited dividend, or mutual associations.

Eligible Areas:

- Rural areas and towns with a population of 5,000 or less
- Areas without telecommunications facilities or areas where the applicant is the recognized telecommunications provider are eligible
- Contact the local USDA Rural Development office to determine whether a proposed service area qualifies

Funding Availability:

Total funding of $690 million nationwide is available for this program.

Applications are accepted year-round and are not competitive.

Minimum Loan Amount: *$50,000*

Funding Types:

- Cost-of-Money Loans are direct loans from USDA Rural Utilities Service
- Loan Guarantees of up to 80% allow private lenders, including the Federal Financing Bank (FFB), to extend credit to qualified borrowers in rural areas
- Hardship Loans may be used, at the sole discretion of USDA Rural Utilities Service, to assist applicants in meeting financial feasibility requirements for applications to serve underserved areas

Loan Terms:

- Cost-of-money loans: Fixed rate at current U.S. Treasury rates depending on loan maturity at time of each advance. Interest Rate equal to U.S. Treasury Yield Curve rates for instruments with comparable maturities (commonly referred to as “Constant Maturity Treasury” rates or “CMTs”)

- Loan Guarantees: Fixed rate primarily from the Federal Financing Bank (FFB). Interest rates (Treasury rate plus 1/8%) vary depending on call options and the interim maturity rate selected at each advance, which may be as short as 90 days, with auto-rollover. Current rates available online, scroll down to "Treasury Constant Maturities" add 0.125% for FFB rate
- Hardship loans: fixed interest rate of 5% for up to 20 years and requires special qualifications

Other Requirements:

- Borrowers must have legal authority to provide, construct, operate and maintain the proposed facilities or services
- All facilities financed with the aid of federal dollars must be used for a public purpose
- May not duplicate similar services available in the same area
- Partnerships with other federal, state, local, private and non-profit entities are encouraged

Additional Information:

Code of Federal Regulations: 7 CFR Part 1735

Website: https://www.rd.usda.gov/programs-services/telecommunications-infrastructure-loans-loan-guarantees

4. Electric Program Smart Grid Loan Program

The RUS Electric Program has a $5.0 billion annual loan budget for financing electrical infrastructure in rural areas, including Smart Grid networks. The Electric Program makes loans to borrowers for fully integrated "Smart Grid" purposes, including fiber-optic network infrastructure from electrical generation facilities directly to the meters of electric service customers. Smart Grid capabilities can improve reliability, promote energy efficiency, enhance grid security, advance safety, provide security, reduce pollution and restrain consumer electricity costs. It is the policy of RUS to promote smart grid deployment among all electric utilities serving rural consumers.

It is also the policy of RUS to promote the deployment of broadband services in rural areas. The RUS Electric Program and the RUS Telecommunications Program will work together to find innovative ways to facilitate joint efforts between Electric Program and Telecommunications Program borrowers to provide Smart Grid and broadband capabilities in shared service areas.

In areas where the electric utility may also provide broadband service to electric customers, the RUS Electric Program and Telecommunications Program will work together to provide financing for eligible components for both purposes in one concurrent loan.

In areas where the electric utility may not provide retail broadband service to electric customers, a public partnership with a nonprofit provider (e.g. cooperative) or a private sector provider should be considered.

Uses of Funds: All facilities receiving federal financing must be used for a public purpose.

Funds may be used to finance:

- Maintenance
- Upgrades
- Expansion

- Replacement of distribution, sub-transmission and headquarters (service, warehouse) facilities
- Energy efficiency
- Renewable energy systems
- Fiber-optic Smart Grid Fiber-to-the-Meter (FTTM) Communications Networks

Electric Program borrowers seek to enhance the use of fiber-optic networks for Smart Grid deployments to offer their customers additional services such as high-speed consumer broadband service.

Smart grid and broadband services are separate and distinct loan purposes, even though the network components are the same.

RUS will ensure that statutory boundaries between programs are respected, and unnecessary duplication of federal funding avoided, in cases where a converged fiber infrastructure can be used for multiple purposes.

While the Electric Program can fully fund Smart Grid infrastructure, it cannot solely finance the delivery of consumer broadband services. If an Electric borrower (or applicant) were to seek Electric Program funding solely for the purpose of providing broadband services (with no Smart Grid elements); the application would be rejected by the Electric Program because the application seeks to use Electric Program funds to finance an ineligible purpose. In that case, the borrower would be referred to the Telecommunications Program for further consultation.

Similarly, in cases where Electric Program borrowers seek to provide consumer broadband services in addition to Smart Grid capabilities, the borrower cannot use Electric Program funding for the enhancements to the Smart Grid infrastructure necessary only to deliver consumer broadband services. The borrower can self-fund, or use non-Electric Program financing, including RUS Telecommunications Program financing, for the enhancements necessary to provide consumer broadband services but not necessary for Smart Grid capabilities.

Broadband network elements ineligible for Smart Grid funding include customer premise inside wiring, and gateways, routers and set-top boxes located inside the customer premise. Elements of network infrastructure from generation facilities to electric customer meters are eligible expenditures.

Constraints on Electric Program Smart Grid funding may be necessary for fiber to the meter (premises) Smart Grid projects that propose broadband services in areas where there are existing RUS Telecommunications borrowers providing the services.

Electric Program and Telecommunications Program borrowers are strongly encouraged to collaborate and cooperate in efforts to deliver Smart Grid and high-speed broadband services to rural consumers within the territories served by both borrowers.

Electric utilities not prohibited from providing consumer broadband service by state law or corporate charter may provide broadband services to electric customers over Smart Grid network infrastructure funded by the Electric Program. In states with laws restricting electric utilities from providing retail broadband services, a nonprofit (e.g. cooperative) or private-sector broadband provider partnership should be considered.

Eligible Entities:

- Most retail distribution or power supply providers serving qualified rural areas, including:
- States, Territories, Local Governments and Government Agencies

- People's Utility Districts, Communications Union Districts, Public Service Districts
- Federally Recognized Indian Tribes
- Nonprofits, including cooperatives and limited dividend or mutual associations
- For-profit businesses (must be a corporation or limited liability company)
- Partnerships with other federal, state, local, private and non-profit entities are encouraged

Borrowers must provide or propose to provide:

- The retail electric service needs of rural areas, or
- The power supply needs of distribution borrowers under the terms of power supply arrangements satisfactory to RUS.

Eligible Area:

The law requires consideration of several factors to determine whether an area qualifies as rural for the purposes of this program.

A Rural Determination must be performed by RUS for a potential New Borrower or a Returning Borrower.

- Identifies all areas within a service territory of a borrower or applicant that are rural in comparison to areas that are not rural (i.e., urban).
- Electric facilities to be financed must provide service to Rural Electrification Act Beneficiaries (person, business, or other entity located in a rural area).
- Rural Determination is not an issue for Existing Borrowers (exclusive of certain Acquisitions, Mergers and Consolidations)

Interested electric utilities who are first-time borrowers should contact one of the area Electric Program General Field Representatives (GFRs) to request a Rural Determination from RUS.

Contacts for Electric Program State GFRs may be found at the following link:
https://www.rd.usda.gov/contact-us/electric-gfr

Funding Availability:

- $5.5 billion in FY 2018
- Funding expected to remain level for FY 2019
- Maximum Loan Amount: No stated maximum
  - $68+ million loan reported in 2017

Types of Funding:

- Direct Cost of Money Loans
- Loan Guarantees up to 100% allow the Federal Financing Bank (FFB) to extend credit to qualified borrowers in rural areas. 100% of the construction work plan can be financed
- Hardship Loans may be used, at the sole discretion of the Rural Utilities Service, to assist applicants in rural areas that are either economically distressed or recovering from an unavoidable event, such as a natural disaster

Loan Terms:

Repayment may not exceed the useful life of the facility being financed, with a maximum repayment schedule of 35 years. Power supply borrowers are also limited by the terms of their wholesale power contracts

- Loan Guarantees and Treasury Rate Loans: interest rates are fixed at the time of each advance based on rates established daily by the United States Treasury plus 1/8 of 1%

The 30-Year CMT Rate on December 14, 2018 was 3.14%

Hardship Loans: interest rates are fixed at a rate of 5% for up to 35 years

Borrowers must have legal authority to provide, construct, operate and maintain the proposed facilities or services

Loan Security:

- Unsubordinated Security Interest in assets of utility as a going concern
- For public utilities owned by local governments, states, territories and public power districts, RUS will accept a pledge of revenues.

Loan Application Process:

The Loan application process is paperwork intensive. Loan application preparation, review and approval by RUS can take from 12 months to 18 months for a new borrower.

Rural Determination by RUS is the first step.

Key Loan Application Documentation:

- Load Forecast
- Construction Work Plan (CWP)
- Environmental Assessment and Maps
- Report of Impacts on Historic Preservation
  - State Historic Preservation Office Notification and Clearance
  - Notifications to Tribes
- Long Range Financial Forecast (LRFF) (10-year Period)
- Useful Life Certification
- At least 90% of loan funds for facilities with useful life of 33 years or more
  - Schedule of Facilities and/or Useful Life Worksheet
- Reimbursement Schedule for Distribution Facilities
- Attorney Opinion Letter
- Board Resolution requesting Rural Electric Infrastructure Loan or Loan Guarantee

Complete list of required documentation at 7 CFR §1710.501

Additional Information:

Code of Federal Regulations: 7 CFR Part 1710

Website: https://www.rd.usda.gov/programs-services/all-programs/electric-programs

5. Leveraging the Water & Waste Disposal Loan & Grant Program

Purpose:

This program provides funding for clean and reliable drinking water systems, sanitary sewage disposal, sanitary solid waste disposal, and storm water drainage to households and businesses in eligible rural areas.

The program helps very small, financially distressed rural communities extend and improve water and waste treatment facilities that serve local households and businesses. Good practices can save tax dollars, improve the natural environment, and help manufacturers and businesses to locate or expand operations.

RUS Water and Wastewater disposal loans and grants may be leveraged to co-locate broadband conduits during trenching. Approximately 80% of the cost of underground network deployment is in the trench. RUS Broadband programs may provide grants for materials and labor to co-locate the conduits during construction.

Eligible Applicants:

- Most state and local governmental entities
- Private nonprofits
- Federally-recognized tribes
- Eligible Areas:
- Rural areas and towns with populations of 10,000 or less
- Tribal lands in rural areas
- Colonies

Type of Funding:

Long-term, low-interest loans

If funds are available, a grant may be combined with a loan if necessary to keep user costs reasonable.

Uses of Funds:

Funds may be used to finance the acquisition, construction or improvement of:

- Drinking water sourcing, treatment, storage and distribution
- Sewer collection, transmission, treatment and disposal
- Solid waste collection, disposal and closure
- Storm water collection, transmission and disposal
- In some cases, funding may also be available for related activities such as:
  - Legal and engineering fees
  - Land acquisition, water and land rights, permits and equipment
  - Start-up operations and maintenance
  - Interest incurred during construction
  - Purchase of facilities to improve service or prevent loss of service
  - Other costs determined to be necessary for completion of the project

See 7 CFR Part 1780.7 and 1780.9 for a complete list of related activities

Funding, Loan Term and Rate:

- Funding announced each year.
- 40-year payback period, based on the useful life of the facilities financed
- Fixed interest rates, based on the need for the project and the median household income of the area to be served

Interest Rates:

Interest rates for 3rd Quarter FY 2018, effective July1, 2018 to September 30, 2018

Poverty: 2.375%

Intermediate: 3.125%

Market: 3.875% USDA Rural Development Water and Waste Disposal Loan and Grant

Program Governance:

Basic Program – 7 CFR, Part 1780

Loan Servicing – 7 CFR, Part 1782

Section 306 of the Consolidated Farm and Rural Development Act

Additional Requirements:

Borrowers must have the legal authority to construct, operate and maintain the proposed services or facilities.

- All facilities receiving federal financing must be used for a public purpose.
- Partnerships with other federal, state, local, private and nonprofit entities that offer financial assistance are encouraged.
- Projects must be financially sustainable.

Contacts:

RUS State Director

A list of RUS State Directors may be found at the following link:

https://www.rd.usda.gov/about-rd/leadership/state-directors

6. ReConnect Program (Broadband Loan and Grant E-Connectivity Pilot Program)

P.L. 115-141 appropriated $600 million to RUS to "conduct a new broadband loan and grant pilot program." The details of the pilot program are still being worked out by RUS, but the authorization calls for "expedited" delivery of the new program. Conditions mandated by the bill will include:

- Ninety percent of the households served by any project funded through this program must be unserved or underserved with 10 Mbps broadband downstream and 1 Mbps upstream
- Any entity receiving funds from the program is prohibited from overbuilding an existing RUS

borrower
- No more than 4% of funds received through the program can be used towards administrative costs.

Program rules published to date are described in a later section of this Funding report.

Federal Communications Commission

The Federal Communications Commission (FCC) is an independent U.S. government agency. The FCC was established by the Communications Act of 1934 and is charged with regulating interstate and international communications by radio, television, wire, satellite and cable. The FCC's jurisdiction covers the 50 states, the District of Columbia, and U.S. possessions.

The Commission staff is organized by function. There are seven operating Bureaus and ten Staff Offices. The Bureaus' responsibilities include: processing applications for licenses and other filings; analyzing complaints; conducting investigations; developing and implementing regulatory programs; and taking part in hearings. Even though the Bureaus and Offices have their individual functions, they regularly join forces and share expertise in addressing Commission issues. Through these offices, funding is specifically designed to meet the needs of each applicant.

1. Universal Service Fund

In accordance with the Telecommunications Act of 1996, the FCC established the following four programs within the Universal Service Fund, of which the Connect America Fund, Schools and Libraries and Rural Health Care Programs are focused on expanding accessible, affordable, high- speed broadband service:

- Connect America Fund (formally known as High-Cost Support) for rural areas
- Lifeline (for low-income consumers), including initiatives to expand phone service for residents of Tribal lands
- Schools and Libraries (E-rate)
- Rural Health Care (appropriations funding levels for this program have been insufficient to compensate service providers offering RHC services)

Connect America Fund

On July 24, 2018, the FCC auctioned subsidies totaling $198 million annually for 10 years for a total of approximately $1.98 billion to service providers committing to offer voice and broadband in unserved census block groups identified by the FCC.

Formerly known as the Universal Service High Cost Program, the Connect America Fund (CAF) reduces the cost of extending and operating fixed and mobile broadband infrastructure to serve consumers and small businesses in rural, "high-cost" areas where long distances between communities, low population and low household density increase the costs of infrastructure deployment and operation.

The goal of Universal Service is to promote the availability of quality services at just, reasonable and affordable rates for all consumers, including those in low income, rural, insular, and high cost areas, at rates that are reasonably comparable to those charged in urban areas.

Eligibility: Wireline and wireless telephone companies seeking to participate in any of the High Cost Program support components must be designated an "eligible telecommunications carrier" ("ETC") and meeting ongoing requirements by the applicable state or, in cases in which the state does not have jurisdiction over a particular type of provider, the Federal Communications Commission.

The FCC provides information about the process to become an eligible telecommunications carrier. Based on currently proposed rules, bidders will have up to 180 days after award to complete the certification process.

Use of Funds:

CAF subsidies are offered to telecommunications companies throughout the U.S. to upgrade and expand their networks as required to provision broadband service at a minimum speed of 10 Mbps downstream from the Internet to the consumer's premise and 1 Mbps upstream from the premise to the Internet. Telecommunications companies accepting CAF subsidies receive the subsidies over a period of six or ten years.

If accepted, these subsidies replace subsidies the companies may have previously received to provide telephone service in High Cost areas and replace them with subsidies obligating them to upgrade their networks to provide broadband service at various speed tiers in their serving areas.

Funding Awarded to Date:

In August 2015, ten of the Nation's largest telephone companies (the "Price Cap Carriers") accepted over $1.5 billion in annual support, for a total of approximately $9 billion in subsidies over a six-year period, to provide broadband to nearly 7.3 million consumers in 45 states and the Commonwealth of the Northern Mariana Islands

- AT&T, CenturyLink, FairPoint, Frontier, Windstream, and other price cap providers accepted subsidies over a six-year period in exchange for a commitment to upgrade and maintain voice and broadband networks capable of 10 Mbps download/1 Mbps upload speed in their traditional telephone serving areas. Of these locations, over 2 million households did not have access to broadband at speeds of 3 Mbps download /768 kilobits per second (kbps) upload at that time. 40% of the build-out was required to be completed by the end of 2017 and 100% by 2020.
- Verizon was offered $144 million annually or a total of approximately $864 million for states in its serving area, but did not accept funding for any of the states that would remain in its serving area assuming its then pending sale of lines in California and Texas to Frontier. According to a letter to the FCC, Verizon essentially accepted funding totaling $48.5 million on behalf of Frontier on the condition that the deal went through.

In August 2016, the FCC released the final version of the Alternative Connect America Cost Model (A-CAM), which determined the amount of "model-based" support to be received by carriers agreeing to serve "high-cost" census blocks.

The FCC offered nearly 700 small, rural local telephone companies throughout the U.S. over $10 billion in model-based support over 10 years to upgrade their broadband networks and provide broadband at various speed tiers in the high-cost locations eligible for support.

This phase of the Connect America Fund targeted over 821,000 home and business locations in areas served by the rural companies that did not have 10 Mbps download/1 Mbps upload broadband service available. For companies accepting the FCC's offer, the new model-based support for broadband-grade service would replace subsidies the companies previously received to provide voice-grade service. The telephone companies had until November 1, 2016, to decide whether to accept or reject the offer.

A total of 207 carriers are now authorized to receive model-based FCC support for broadband in high-cost areas. The total amount of model-based support to be issued over a 10-year period is $5.283 billion.

Census Blocks declined by the Price Cap Carriers:

In August 2016, the FCC published a preliminary list of high-cost census blocks that the Price Cap carriers had declined to serve. For these areas and other unserved areas across the U.S., the Commission stated that it would hold the **Connect America Phase II Reverse Auction**, through which eligible service providers would compete to receive support of up to $1.98 billion over a 10-year support term to offer voice and broadband service to fixed locations.

Alaska, New York, Puerto Rico and the Virgin Islands were not eligible to compete in the Reverse Auction.

- **CAF Mobility Fund Phase II and Tribal Mobility Fund Phase II Auction:** On Feb. 23, 2017, the Commission adopted the framework for the Mobility Fund Phase II and Tribal Mobility Fund Phase II auction, to allocate up to allocate up to $4.53 billion over a 10-year support term to advance the deployment and maintenance of 4G LTE in certain rural areas.

- 2018 Phase II Reverse Auction:

1. In June 2017, the FCC published a list and map of high-cost census blocks to be excluded from the FCC Phase II Reverse Auction because support for these census blocks had been claimed by the Price Cap carriers who accepted statewide annual support. The Price Cap carriers must serve at least 95% of the census blocks. The FCC requested the Price Cap carriers to confirm the census blocks they intend to serve in a response to the FCC no later than July 7, 2017. Census blocks that will not be served by the Price Cap Carriers will be added to the list of eligible census blocks for the Connect America Fund Phase II Reverse Auction.
2. Maps of areas claimed by the Price Cap carriers to receive high-cost funding support are available on the FCC's website under Maps and Publications.
    - On August 4, 2017, the Federal Communications Commission initiated the pre-auction process for the Connect America Fund Phase II auction ("Phase II auction") or "Auction 903". The FCC Public Notice proposed pre-auction and bidding procedures and processes and requested public comments.
3. Auction 903 held on July 24, 2018, awarded up to $198 million annually for 10 years for a total of approximately $1.98 billion to service providers committing to offer voice and broadband services to fixed locations in unserved high-cost areas.
4. Auction 903 was the first auction to award ongoing high-cost universal service support through competitive bidding in a multiple-round, reverse auction. The Commission's stated intention was "to maximize the value the American people receive for the universal service dollars we spend, balancing higher-quality services with cost efficiencies".
5. The auction was designed to select bids from providers that would deploy high-speed broadband and voice services in unserved communities for lower relative levels of support.
6. The Commission expected that Auction 903 would attract parties that had never participated in a Commission auction.

The results of the CAF Reverse Auction may be found at the following link:

https://www.fcc.gov/reports-research/maps/caf2-auction903-results

Additional Information:

Website:

https://www.fcc.gov/general/universal-service-high-cost-areas-connect-america-fund

Universal Service Schools and Libraries Program

This program is also known as the "E-Rate" program and is administered by the Universal Service Administrative Company (USAC) under the direction of the Federal Communications Commission. When E-Rate was established in 1996, only 14 percent of the nation's K-12 classrooms had access to the Internet. Today, virtually all schools and libraries have Internet access. The FCC began updating E-rate in 2010 and in July 2014, released the E-rate Modernization Order expanding Wi-Fi networks in schools and libraries across America while ensuring support continues to be available for broadband connectivity to schools and libraries.

With new reforms adopted in 2014 aimed at providing tools and competitive options for purchasing fiber broadband connectivity, more schools and libraries are connected to high-speed broadband each year.

Use of Funds: The E-rate Program provides discounts of up to 90 percent for broadband connectivity to and within elementary and secondary schools (public and private) and public libraries in rural and non-rural areas. Funding is provided through an annual application process with schools, libraries and consortia of schools and libraries applying for funding. A discount increase of up to 10 percentage points is available for schools and libraries in rural areas depending on the poverty level.

Schools may request funding for wireless or wireline broadband services, as well as for unbundled services including leased fiber, as follows:

- Dark Fiber Leasing
- Lit Fiber Leasing
- Dark and Lit Fiber Leasing
- Self-provisioned Services and Services provided over Third-party Networks
- Transport Only
- Internet Access Only

Schools and libraries have the flexibility to lease dark and provision their own broadband services, allowing for opportunities to share fiber-optic cable with fiber owners in the area.

Eligibility:

To be eligible,

A. Schools must provide elementary or secondary education as determined under state law.
B. Schools may be public or private institutional day or residential schools, or public charter schools.
C. Schools must operate as non-profit businesses.
D. Schools may not have an endowment exceeding $50 million.
E. Libraries must be eligible for assistance from a state library administrative agency.
F. Libraries must have budgets completely separate from any schools (including, but not limited to, elementary and secondary schools, colleges and universities).
G. Libraries may not operate as for-profit businesses.

Availability of Funding: Applications to receive funding are accepted on an annual basis. In 2015, the FCC voted to raise the E-rate's annual spending cap from $2.4 billion to $3.9 billion. In the last two funding years, the E-rate Program has funded $5.6 billion in funding requests for connectivity to and within schools and libraries, including $2.1 billion in support for the equipment needed to deploy Wi-Fi to students and library patrons in all 50 states.

Additional Information:

Websites:

FCC E-rate:

https://www.fcc.gov/general/universal-service-program-schools-and-libraries-e-rate

USAC:

http://www.universalservice.org/sl/about/getting-started/default.aspx

United States Department of Commerce

Economic Development Administration

Public Works and Economic Adjustment Grants

EDA's Public Works program helps distressed communities revitalize, expand, and upgrade their physical infrastructure. This program enables communities to attract new industry; encourage business expansion; diversify local economies; and generate or retain long-term, private-sector jobs and investment through the acquisition or development of land and infrastructure improvements needed for the successful establishment or expansion of industrial or commercial enterprises.

EDA Public Works program investments help facilitate the transition of communities from being distressed to becoming competitive by developing key public infrastructure, such as technology-based facilities that utilize distance learning networks, smart rooms, and smart buildings; multitenant manufacturing and other facilities; business and industrial parks with fiber optic cable; and telecommunications and development facilities.

In addition, EDA invests in traditional public works projects, including water and sewer systems improvements, industrial parks, business incubator facilities, expansion of port and harbor facilities, skill-training facilities, and brownfields redevelopment.

Selection Criteria:

- The project's demonstrated alignment with at least one of EDA's current investment priorities as published on EDA's website at www.eda.gov
- The project's potential to increase the capacity of the community or region to promote job creation and private investment in the regional economy
- The likelihood that the project will achieve its projected outcomes
- Ability of the applicant to successfully implement the proposed project, including the applicant's financial and management capacity and the applicant's capacity to secure the support of key public and private sector stakeholders

Regular Appropriations for FY 2019 for the Department of Commerce has not yet been passed into law.

In FY 2018 Supplemental Funding for Disaster Relief was approved making $587 million available to eligible grantees in communities impacted by natural disasters, which could be used to rebuild infrastructure or fund infrastructure resiliency projects.