Clallam County, Washington Broadband Feasibility Study Report

Submitted by:

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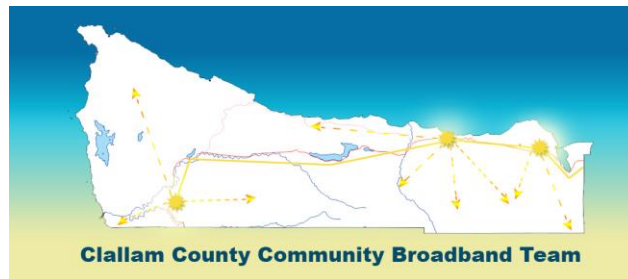
CBG Communications, Inc.
Thomas G. Robinson, President & CEO
Dick Nielsen, Senior Engineer
Krystene Rivers, Senior Research Associate

and

Telecommunications Research Corporation
Constance Ledoux Book, Ph. D.

and

GeoDecisions
Brian Rudolph, GISP, Sr. Project Manager

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Executive Summary

EXECUTIVE SUMMARY

For the past year, (April 2020 through March 2021), CBG Communications, Inc. ("CBG") has been working with the Clallam County Community Broadband Team ("Team") to examine the current state of Broadband services and infrastructure in Clallam County (defined as having access to the Internet with speeds of at least 3 Megabits per second [Mbps] in the upstream direction to be able to upload content, and at least 25 Mbps in the downstream direction to be able to download content). As part of this examination, CBG and the Team have reviewed the current and future needs of residents, businesses and anchor institutions for such Broadband infrastructure and services, and have explored and identified feasible scenarios to enhance and expand Broadband to meet the needs of Clallam County constituencies and the State of Washington's overarching Broadband goals (the State wants to ensure that all residents and businesses have access to Broadband service by 2024; all anchor institutions have 1 Gigabit per second [Gbps] symmetrical access [equal upload and download speeds by 2026; and 150 Mbps symmetrical Broadband service availability for all residents and businesses by 2028).

In the report that follows, CBG and the Team describe a Vision for the County, along with associated goals, to achieve expansions and enhancements in Broadband services and infrastructure over the next seven years. Beyond this, one of the first activities during the development of the Feasibility Study and Plan that follows this summary, was to develop a roadmap for the project to arrive at multiple, feasible scenarios to achieve the Vision and Goals.

The roadmap established a process to look at the existing state of Broadband service and infrastructure in 2020 and map that for the County as a whole and also specifically for Sequim and the Eastern portion of the County, Port Angeles and the central portion of the County and Forks and the western end of the County. As part of this, existing Broadband Providers were identified and discussions were held with them concerning their services, infrastructure and coverage areas. A Needs Assessment process was designed consistent with the Washington State Community Economic Revitalization Board (CERB) requirements for the grant that was part of the funding for the Feasibility Study. It first resulted in a series of three virtual Community Broadband Meetings[1]. While the virtual meetings provided opportunities for obtaining a lot of information from organizational representatives, Broadband providers, and residential and business community members at large, it was determined that it would be important to additionally develop a survey, promote it heavily, and obtain feedback from many that were not able to attend virtual meetings. This resulted in a wealth of data from community members throughout the County that is profiled in the study.

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[1] The Feasibility Study Project described in this Summary, as well as in the Report that follows, occurred during the Covid-19 pandemic which caused continual Stay-at-home Orders to be put in place, such that all meetings, site reviews, and other information gathering activities had to occur virtually. Typically, in projects of this type, a number of on-site visits will be made to observe, gather information and conduct meetings in person, but this was not possible during this project.

Along with this, CBG and the Team worked with the State to obtain granular data from the Washington State Broadband Speed Test and Survey. All of this was able to be geocoded, to further determine the availability, and therefore, also the lack of, or gaps in, availability of Broadband infrastructure and services in the County.

A review of the needs assessed through these various processes, resulted in determination of six key considerations for identifying feasible ways to expand and enhance Broadband in Clallam County. These key considerations included the following:

- Having a connection to the Internet with at least minimum Broadband speeds is critical to the vast majority of residents and businesses in Clallam County,

- Reliability is also a critical factor,

- Aging Broadband/Internet infrastructure is a problem,

- Many of those with and without access are willing to pay a premium to achieve continuously reliable, high-speed Internet service, but the cost still must be affordable (in other words, not outrageous, extraordinarily high or astronomical),

- Numerous pockets of residents exist just outside of areas where Broadband service is available, and

- Beyond Service Availability, there are other Digital Equity issues in the County.

Based on these critical considerations, a number of feasible scenarios are recommended to expand and enhance Broadband services and infrastructure in the County. These include:

- **Expansion of Middle Mile Fiber Infrastructure** – The Clallam Public Utility District (PUD) already has some existing fiber optic infrastructure in the Sequim – Port Angeles area and certain other places in the County that can be viewed as middle mile fiber infrastructure. The PUD or other entity expanding this to cover the footprint of the PUD's backbone throughout the County (in other words, out to Neah Bay and out through Forks and down to La Push) will help engage private providers to develop the last mile infrastructure needed to provide Broadband services to numerous areas that are currently unserved (meaning that there is only dial-up and satellite services available in those areas, or other Internet access that does not achieve Broadband speeds).

- **Expansion of Wave Broadband Infrastructure** – Wave's current provision of Broadband services and infrastructure is nearby numerous pockets of residents that do not currently have Broadband. An expansion of Wave's Broadband footprint could be achieved through Wave working with its existing local government Franchisors, use of its own corporate and private equity funding, and taking advantage of State and Federal Grant opportunities.

- **Federally-supported Expansion of CenturyLink and Starlink Broadband Infrastructure** – Both CenturyLink and Starlink received Federal Rural Digital Opportunity Fund (RDOF) Phase I funding to expand their Broadband infrastructure and services, primarily in the western portion of the County, but also to certain other unserved

and underserved pockets. A review of the awards, though, indicates that neither will provide Broadband services to everyone in their awarded areas, and the technologies behind the provision of their services (Gigabit xDSL and low earth orbital satellite service), are still emerging. This means additional solutions will be needed beyond their Federally - supported services expansion.

- **Development of a Private Provider Partner(s) to Expand Fiber-to-the-Premises (FTTP) / Fiber-to-the-Home (FTTH) Service Provision throughout the County** – This scenario, over a period of the next 7-10 years, would be feasible if expanded public middle mile infrastructure is available, outside funding through Federal and/or State grants, loans and private equity funding provides a portion of the system development support, and key constituencies of the County (such as those who currently make up the Team) act in a concerted effort with their public/private partners.

In this vein, **our overarching recommendation, is to develop a Clallam County Broadband Authority (CCBA)** that would:

- Coordinate between its members and their constituencies

- Collaborate with private providers

- Pursue all feasible funding avenues, such as: Federal, State and local Grants and Loans; and private investments through private equity capital markets and private grants and loans; and

- Oversee the variety of Public, Private, and Public-Private projects that we see as feasible to help expand and enhance Broadband services and infrastructure in the County

If aggressive and progressive steps are taken first by members of the Clallam County Broadband Team and then by the CCBA, between now and 2024, this should make minimum Broadband available to those who currently do not have access. Continuing on that track will further help to meet the State's 2026 goal of 1 Gbps to every anchor institution, and the 2028 goal of 150 Mbps symmetrical service to every home and business.

All of the above information, scenarios and recommendations were incorporated into a full draft report and exhibits that were published for public comment prior to completion of this final version of the Broadband Feasibility Study.

CBG and the Team wish to thank all of those who participated in this project throughout the past year to help develop the feasible Broadband enhancement and expansion scenarios that are more fully detailed in the Report that follows.

Section 1 – Introduction and Background

SECTION 1 - INTRODUCTION AND BACKGROUND

Clallam County (County), Washington, a County of 2,671 square miles on the northern portion of the Olympic Peninsula in Washington State, is known for its pristine natural beauty, including Olympic National Park, and its exemplary quality of life that draws residents and visitors alike. As of the 2019 U.S. Census estimate[2], there were 77,331 residents living in 32,958[3] households (37,728 housing units)[4] in the three incorporated municipalities and in the unincorporated County. Specifically, regarding households there are: 3,508 in Sequim in the eastern portion of the County; 8,783 in Port Angeles more towards the central portion of the County and 1,510[5] in Forks in the western portion of the County. The rest, 19,157, are in the unincorporated County.

There are also four tribal nations within the boundaries of the County, including the Quileute, the Makah, the Lower Elwha Klallam, and the Jamestown S'Klallam tribes.
What is not exemplary in Clallam County is access to broadband services. As detailed later in this report, more than a quarter (28%) of the homes (9,960) were determined not to have access to broadband services.[6] Broadband services are defined by both the Federal Communications Commission (FCC) and the State of Washington to be Internet access with speeds of at least 3 Megabits per second (Mbps) upload and 25 Mbps download. Many of the households without broadband access have Internet access, but some are at or near dial-up speeds even though they may be accessing a digital subscriber line (DSL) connection.

<u>Formation of the Clallam County Community Broadband Team</u>

Understanding that access to broadband is a substantial problem in Clallam County, affecting not only residents, but businesses (both in retaining businesses and attracting new ones) and tourism (wherein visitors will expect access to high-speed Internet services), the North Olympic Peninsula Resource Conservation & Development Council (NODC), the federally-designated regional Economic Development District focused on both Clallam and Jefferson Counties, held a symposium in March 2019 to seek information from a variety of interested organizations about activities occurring in other areas of the State that may help provide examples of a path forward for Clallam County. As a result of the symposium, Broadband Action Teams (BATs) formed for Sequim, Port Angeles, and unincorporated Clallam County. The three teams submitted a joint

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[2] https://www.census.gov/quickfacts/fact/table/clallamcountywashington,sequimcitywashington/PST045219.
Sources: U.S. Census Bureau, Population Estimates Program (PEP), updated annually. Population and Housing Unit Estimates.

[3] https://www.census.gov/quickfacts/fact/table/clallamcountywashington,sequimcitywashington/PST045219.
Sources: U.S. Census Bureau, American Community Survey (ACS), 5-Year Estimates. The Survey is updated every year.

[4] The 2010 Census indicates 35,502 housing units, a difference of 2,226. This number is the baseline used in this report to estimate the number of housing units without broadband availability, because it is the only one detailed at the census block level.

[5] https://datausa.io/profile/geo/forks-wa#housing

[6] The 2019 Census estimates this number at 15.5% of households, but will not take into account seasonal housing and other factors contributing to a higher number of housing units not having broadband availability. This should be re-evaluated once the actual 2020 Census data is released.

application to the Washington Department of Commerce's Community Economic Revitalization Board (CERB) requesting a grant for a county-wide broadband planning and feasibility study. The grant was submitted by the Port of Port Angeles (Port) along with Clallam County, Port Angeles, Sequim and Forks, with all contributing to the required matching funds for the project.

Subsequently, the grant was awarded and CBG Communication Inc. (CBG) was hired to conduct the Broadband Planning and Feasibility Study. As part of fulfilling the initial CERB requirements, a consolidated Clallam County Community Broadband Team (Team) was formed and broadened to include members from other anchor institutions. The complete Team member list can be found at the end of this Section. The NODC and the Port directly coordinated the project for the Team.

Prior Planning Efforts

At the beginning of the project, it was important for CBG to understand the work that had already been done related to planning and broadband feasibility for the County. Team members provided documentation concerning two previous planning efforts which was reviewed by CBG in order to understand the focus of those efforts and the outcomes to date.[7]

In 2004, Washington State University's Department of Community and Rural Sociology developed a report called "From Timber to Technology: A Community's Efforts to Bridge the Digital Divide"[8], which focused on the substantial digital divide issues in one of the municipalities in Clallam County: Forks. The focus of the project was wide-ranging and looked at: the needs for broadband telecommunications infrastructure, including redundant connections; providing technology access; providing computer literacy; and overall methods of bridging the digital divide. As part of this project an ICN (Integrated Community Networks) Committee was developed. Directions for the future were established to find ways to continue to close the digital divide and expand access for community development, economic development and overall societal development in Forks and the western end of the County.

Subsequent to this project, as part of the broadband planning activities under the American Recovery and Reinvestment Act (ARRA), a Western Olympic Local Technology Planning Team (WOLTPT) was established to look at broadband planning and expansion possibilities for the western portions of both Clallam and Jefferson Counties. This effort again was headed up by Washington State University in conjunction with the Washington State Broadband Office, the North Olympic Peninsula Resource Conservation and Development Council, and U.S. Congressional and Senatorial Offices. This study occurred between July 2013 and June 2014 ("A Broadband Roadmap for Rural and Tribal Communities of the Western Olympic Peninsula 2014"[9]) and included participants from: broadband providers; local, state and federal government offices; the six tribal nations; K-12 and higher educational institutions; non-profit and community organizations; businesses and local community members.

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[7] This documentation is reflected in the Bibliography to this report.

[8] This can be found in the Bibliography, #13.

[9] See Bibliography, #14.

The planning team looked at the availability of broadband at that time in the western part of Clallam and Jefferson counties, and the need for expansion of broadband services to meet critical community and economic needs. They then developed an action plan to develop the infrastructure and services that would meet those needs. There were three phases to the WOLTPT project, including:

- Phase One: Identification of needs and application prioritization by sector
- Phase Two: Identification of existing assets
- Phase Three: Creation of roadmaps

As in the previous 2004 project, information gathering was extensive, the action plans and roadmaps developed were well defined, and broadband since 2014 has expanded somewhat in the Forks area and the western part of the County. At this time, this includes, for example, pilot projects and beta tests developed by a number of the tribal nations. However, the pace of progress has been exceedingly slow and has not achieved the level of success envisioned by either project.

State of Washington Broadband Goals

The State of Washington has developed a series of goals that all broadband planning, development and expansion efforts should accede to, such that the goals can be uniformly achieved within the timeframes given. Specifically, these goals are:

- *Universal provision of broadband speeds and access to all residents and businesses throughout the State by 2024.*

  This means that, at a minimum, each household and business would be able to, if they so desire, gain access to a network that provided them upload speeds of at least 3 Mbps and download speeds of at least 25 Mbps.

  As indicated earlier, in Clallam County, as of this point in early 2021, less than 3/4 of the homes have access to networks with these broadband speeds (businesses within the same geographic area would also have similar access).

- *One Gigabit per second (Gbps) 1000 Mbps symmetrical (equal speeds for both upload and download) access for each anchor institution in the State by 2026.*

  Anchor institutions include all K-12 public, private and parochial schools; all higher education institution locations; all local, state and federal government facilities; all libraries; hospitals; and other related public facilities.

  In Clallam County today, shown in detail later herein, many of the facilities of the organizations listed above do not currently have 1 Gbps symmetrical service; however, a number have the capability for such access because of their fiber-to-the-premise (FTTP) network connections. In these cases, an upgrade in the capacity of the connection would facilitate 1 Gbps access by 2026. Regardless, there is work to do to be able to provide such to <u>all</u> anchor institutions in Clallam County by 2026.

- *150 Mbps symmetrical connections available to <u>all</u> homes and businesses in the State by 2028.*

  This will be the most challenging goal to meet, even considering the seven-year timeframe between now and when the State wants the goal to be met. With over 1/4 of the County not currently achieving basic broadband speeds, achieving symmetrical bandwidth access that is 50 times greater in the upload direction and 6 times greater in the download direction, will take not only substantial physical infrastructure expansion beyond what's currently available today, but substantial upgrades of existing broadband networks. The need for this, and the potential to achieve it, is discussed in detail below.

The Effects of the COVID-19 Pandemic on the Study

The beginning of this Broadband Feasibility Study project happened to coincide with the beginning of the COVID-19 pandemic (COVID-19) in the U.S. As such, the timing presented both *challenges* and *opportunities,* and heightened realizations concerning both the importance of the project and the development of feasible ways to expand and enhance broadband in the County.

Challenges

Specifically, regarding challenges:

Stay-at-Home Orders and Advisories

The Stay-at-Home Orders that have been required off and on during the COVID-19 pandemic, have had the effect of creating an environment where a person's or family's residence has become the center of their working, education and, to a certain extent, healthcare environment. Specifically, the majority of the workforce moved rapidly, beginning in March of 2020, throughout the United States to a Work-From-Home (WFH) environment rather than commuting to a commercial workplace. Thus, telecommuting became nearly overnight a critical function for millions of workers in Washington State and tens of millions throughout the U.S.

Added to this, in-person education at schools, colleges and universities around the country was no longer viable related to the impact of COVID-19, and so again, nearly overnight, tele-education (telelearning) became the new norm.

Further, with clinics closed and hospitals overwhelmed with an ever-increasing number of COVID-19 patients, routine medical visits suddenly had to rely on telehealth mechanisms. Most of the systems related to telecommuting, tele-education and telehealth that were in place at that time, had to adapt on the fly to go from targeted use to mass use. Moreover, all of this relied on broadband systems, that rather than being optimized for business use at business locations, was whatever was available and in place for residential use.

In Clallam County, this suddenly meant that over ¼ of the residents were not positioned to adequately participate in telework, tele-education, and telehealth. In Section 3 of this Report, concerning the Broadband Needs Assessment portion of the project, information obtained from

residents tells the stories of how difficult it has been for those within the County who do not have access to broadband. Just some examples include:

- Students who were not able to participate in telelearning because of the lack of broadband connections at home, and the work-arounds that had to be established, such as bus-mounted hotspots and parents driving their students to public Wi-Fi locations in order to be able to adequately access online educational resources.

- On the flipside, faculty who couldn't teach remotely because of lack of sufficient broadband access at their homes.

- Medical professionals that could not provide care in a telehealth fashion because of lack of broadband from their home locations; and

- Workers who could not telework and had to instead find safe ways to enter closed offices, or use public Wi-Fi themselves in order to telecommute.

In short, COVID-19 vastly exacerbated an already problematic situation for over 1/4 of the population in the County.

Performance of the Study and COVID-19 Protocols

Another challenge was performance of the study itself. These types of broadband feasibility studies heretofore have required substantial "boots on the ground" in order to sufficiently understand the infrastructure issues that are often at the heart of lack of broadband availability. The underlying reasons for lack of infrastructure have a great deal to do with topography and geography, the available service provider environment, and the overall bottom line concerning service provision: the cost of broadband system construction, and installation of such facilities. Typically, this requires on-site engineering and technical review and often drive-outs of existing infrastructure and areas where there is no infrastructure, to most accurately understand the challenges that providers face in bringing broadband, especially to remote rural areas.

Additionally, it is common in these projects to meet in-person with providers, and engage in dialogue, while touring their facilities to get an understanding of how they operate, what their goals and objectives are and their underlying business approach. Moreover, from the user's side, it is common to have large auditorium-style community meetings with not only representatives of constituent groups, but also individual residents and business owners to understand their stories about their needs, and in some cases, why they have chosen not to adopt broadband.

During the entire project, based on COVID-19 protocols, CBG's staff was not able to travel to the County and spend time: meeting with providers; observing the topography and geography onsite; meeting with anchor institutions representatives at their locations; and stopping in and talking to business owners about their challenges, under even what would be considered a normal business environment for broadband.

Instead, CBG and the Community Broadband Team have worked to engage all the necessary constituencies virtually and have done so diligently throughout the entire project. Just like those that now have found ways to effectively telework, telelearn and engage in telehealth, CBG and the Team have, over the course of the project, worked virtually in myriad ways (as explained in detail

below) to overcome the challenge of not being able to perform a portion of the study on-site and, regardless, obtain all the critical information needed to develop a number of scenarios to expand and enhance broadband service in the County.

Opportunities

Specifically, regarding opportunities:

New Focus on Broadband and Related Funding Opportunities

What County residents and businesses have faced, has been faced by tens of millions of rural residents and businesses all across the country. Because of that, the need to expand broadband, and help ensure that the types of services available to residents and businesses in urban and suburban areas are also available in rural areas, has been heightened as a national imperative. There is now a focus on broadband that seemingly has never been greater.

What this means, is that new and increased funding resources are becoming available and broadband providers are now thinking in new ways. As examples, large cable operators (which are the largest providers of broadband service in the country), that have heretofore not ventured into rural areas beyond dense pockets of subscribers, are now pursuing ways to expand their cable (and thus broadband) systems to areas with substantially lower densities than have previously met their historical returns on investments (ROI). Charter Communications (also known as Spectrum), as an example, was recently awarded the 2nd largest amount of funding from the Federal Communications Commission (FCC) Rural Digital Opportunity Fund (RDOF) and indicates that it is expanding its systems into rural areas throughout its service territory footprints in multiple states.[10]

Both State and Federal COVID relief bills have included funding for broadband expansion initiatives, and telehealth and tele-education enhancements, including broadband access, and the prospect for continuation of, and increases in, such funding for this year and beyond is substantial. This means that there are real opportunities for achieving broadband expansion in Clallam County in ways not previously envisioned. This Feasibility Study report discusses several ways to leverage these opportunities.

Inception of the Project

The Broadband Feasibility Study began in earnest in late March of 2020 with initial discussions concerning Project timelines, the sequence of activities as envisioned in the Project scope, and discussions on how to alter the initial methodologies planned to be employed to address the impacts of the COVID-19 pandemic. These discussions lead to an initial kick-off meeting in April

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[10] Charter Communications received $1.2 Billion in funding from the recent December 2020 RDOF Phase 1 funding awards. See Bibliography, #5 and #6.

of 2020 that began the first activities of the project which were the initial joint planning tasks. This is described in detail in the next section of this report.

Acknowledgements

CBG wishes to acknowledge the multiple people and organizations that contributed to this Project. As indicated above, they went above and beyond their initial planned involvement in the project in order to achieve all the project aims, while doing so virtually and reacting to the increased needs of their primary jobs (such as IT managers and others participating in the project, who at the same time had to completely reengineer connectivity for the workforce of their jurisdiction). Specifically, CBG would like to thank the following:

- Co-administrators of the Feasibility Study Project

  - North Olympic Development Council (NODC) - Karen Affeld and her staff,
  - Port of Port Angeles - Karen Goschen and Jesse Waknitz,

- Other Members of Clallam County Community Broadband Team:

  - Clallam County - Rich Meier and Joshua Budd
  - Clallam County Public Utility District (PUD)- Shawn Delplain
  - Clallam County Former PUD Commissioner - David Anderson
  - City of Forks - Rod Fleck
  - Jamestown S'Klallam Tribe - Kyle Johnson
  - North Olympic Library System - Noah Glaude and Shane Miller
  - City of Port Angeles - Todd Weeks and Navarra Carr
  - Peninsula College - Samantha Hines
  - Port Angeles School District - Martin Brewer and Jeff Blauser
  - City of Sequim - Anthony Martin

- From the Office of Congressional Representative Derek Kilmer - Mary Jane Robins

- From the Washington State Broadband Office - Russ Elliott, Director

- Representatives from the Port Angeles, Sequim-Dungeness Valley, and Forks Chambers of Commerce

- Representatives the following Broadband Providers:

  - Nikola
  - OlyPen
  - CressComm
  - Wave Broadband
  - CenturyLink
  - North Olympic Peninsula Data Centers
  - NoaNet

- o Jamestown Networks
- o Representatives from other broadband providers and resellers

- Representatives from the Hoh, Makah, Lower Elwha Klallam, and Quileute Tribes

- All the participants in the three Community Broadband Meetings, and

- All those that completed the Community Broadband Survey

Also, CBG would like to thank its Team Partners, Dr. Constance Book from Telecommunications Research Corporation and Brian Rudolph from GeoDecisions.

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Section 2 - Initial Joint Planning

SECTION 2 - INITIAL JOINT PLANNING

Initial Joint Planning

The Clallam County Feasibility Study Project kickoff meeting was scheduled for late April, 2020 and was designed to: initiate a number of project tasks; discuss various options for those tasks (for example, at that time it wasn't known how long Stay-at-Home-Orders would be in effect related to COVID-19, so there was discussion of both virtual and in-person, or a hybrid of the two, Community Broadband Meetings); introduce the CBG team to the Clallam County Community Broadband Team and vice versa; reach consensus on the various tasks; set up monthly meetings of the Team to update Team members and keep the project on track; and assign roles and responsibilities as needed.

Kickoff

A graphic intensive, detailed PowerPoint discussion guide was used for the kickoff meeting and examples were given of the types of maps that can be generated, methodologies that would be used for various tasks, and the flow of the project from the kickoff meeting to final report development.

Additionally, the CERB grant requirements were discussed in detail, because they would need to be fulfilled during the project based on activities such as the Community Broadband Meetings, and Vision Statement development by the team. Part of the CERB requirements are that various elements of the overall plan developed as part of the feasibility study incorporate input from the public into the final Plan.

Vison Statement

The first thing the team determined to work on together was development of the Vision Statement. CBG was tasked with reviewing broadband vision statements developed by other planning teams and local governments, drafting an initial statement and providing it to the Team for their review and input. CBG developed an initial statement, and determined that it would be important to support the statement with a number of detailed goals. Essentially, fulfillment of the goals by the steps, activities and actions recommended by the Team as an outcome of the project would, in turn, help achieve the Vison that the Team believes is central to broadband expansion and enhancement in Clallam County.

Vision statements are necessarily broad and forward-thinking and meant to arrive at an ideal broadband environment for all the constituencies in the County. The Vision Statement ultimately adopted by the Team, after Team review and modifications made to the initial draft, is the following:

> *"The Clallam County Broadband Team will build on local and regional broadband expansion efforts to ensure that all residents, businesses, schools, libraries, medical facilities, governments, non-profits, and tribal partners have access to affordable, high-capacity broadband infrastructure and services".*

The Vision Statement was published using various media, including the Team's webpage on the North Olympic Development Council's website (described further below) and was reviewed at the Community Broadband Meetings (described in Section 3 of this Report).

Also reviewed at the same time were the goals that support the Vision. Each goal focused on a different constituent group (such as broadband providers, the residential community, businesses, public health and

public safety, educational entities and governments, as well as two that emphasize "building an environment of trust" and promoting a "resilient broadband network throughout the County" (see next page for the full description of the goals adopted by the Team and vetted by the public). The Vision Statement and Goals are also included as Exhibit A to this Report.

Figure 1: Goals of Clallam County Broadband Team

Goals of the Clallam County Broadband Team

1 - Work creatively, innovatively and collaboratively with existing and potential broadband providers to develop multiple funding sources, explore new technologies and leverage existing technologies and infrastructure to expand broadband infrastructure, capacity and services in a manner that delivers affordable access, increases and encourages adoption and provides a reasonable return on investment.

2 - Promote digital inclusion within the residential community by ensuring that all residents have the affordable access, tools and skills needed to become fully connected to and engaged with the Clallam community and the world at large, by taking full advantage of broadband services and the Internet.

3 - Promote economic development and opportunity by ensuring that all businesses have the access, tools and skills needed to take full advantage of broadband services and the Internet.

4 - Promote public health and public safety by ensuring access to broadband services needed by the sheriff, police, fire districts, hospitals, medical and emergency management personnel throughout the County to protect the health, safety and welfare of all the County's constituencies.

5 - Enhance and expand educational opportunities as needed through provision of uniform, high-capacity services to all pre-K-12 and higher education institutions, as well as necessary telelearning services for students at home.

6 - Ensure that governments have high capacity, affordable broadband service for the provision of services electronically to residents, from both within office environments and remotely.

7 - Build an environment of trust between all the County's constituencies as it relates to the development, enhancement, expansion and utilization of broadband services.

8 - Promote a resilient broadband network throughout the County that can continue to be available in the face of natural and manmade disasters, emergencies and other catastrophic scenarios, so that all constituencies in the County can continue to share information and work collaboratively to affect a positive outcome.

Initial Assessment

After the kickoff meeting and while working on the vision and goals, CBG began its initial assessment of three core areas of broadband development, that would also be the focus of the Study Roadmap designed to help steer the project into development of feasible scenarios for broadband enhancement and expansion in the County. These three areas for initial assessment were:

- **Infrastructure and Service Mapping–** the infrastructure that is currently being utilized in the County, and the associated technologies, to provide broadband services, and where not broadband, Internet access,

- **Broadband Providers –** the current broadband providers in the County, the types of technologies that are utilized, the speeds that are realized, and the coverage that is obtained, and

- **Anchor Institutions -** the anchor institutions in the County, and the types of broadband connectivity that the institutions' facilities have and have access to, what they're using at this time and what speeds they are realizing.

What CBG found initially is the following:

Infrastructure and Providers of Internet and Broadband

Initially, CBG relied on Internet research to determine all of the providers of Internet access (both Broadband and non-Broadband) to residents and businesses throughout the County. We then held discussions with members of the Community Broadband Team during regularly scheduled meetings as well as via e-mail and phone calls to gain an understanding of the approximate areas served by each of the known providers as well as the infrastructures used by each. From here, we began the process of contacting the providers to hold discussions to better define each service area, technologies used and advertised speeds delivered to customers in each service area. Because, in part due to the COVID-19 Pandemic, the providers were extremely busy, we had some difficulty connecting with them to hold interviews to gain an understanding of their operating parameters needed to draw a complete picture of where Broadband and Internet are available and the service levels offered by each.

Through persistence and numerous outreach efforts, we were able to obtain varying degrees of information from all but one known provider. We utilized this information to develop maps of the County showing a representation of where Broadband is available and therefore also where it is not available, as detailed further below. This table is also included as Exhibit B.

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Table 1: Initial Provider Assessment

Provider	Technology	Providers' Advertised Speeds				
Wave Broadband	Cable Modem	100/5 Mbps	250/10 Mbps	940/10 Mbps		
CenturyLink	DSL	10 Mbps/50 Kbps	40/3 Mbps			
CresComm	Wireless	12/1 Mbps	20/2 Mbps	25/3 Mbps	25/3 Mbps	
OlyPen	Cable Modem (Wave)	10/1 Mbps	100/5 Mbps	250/10 Mbps	1 Gbps/10 Mbps	
	DSL (CenturyLink)	256/256 Kbps	1.5 Mbps/896 Kbps			
	Wireless	Unknown				
Nikola	Wireless	6/2 Mbps	10/3.3 Mbps	15/5 Mbps	20/6.5 Mbps	25/8 Mbps
	60 GHz (limited areas)	50/50 Mbps	100/100 Mbps			
	Commercial Fiber	100/100 Mbps				
North Olympic Peninsula Data Centers	DSL (CenturyLink)	6 Mbps/500 Kbps	15 Mbps/750 Kbps	30/1.5 Mbps	80/10 Mbps	
	FTTP (CenturyLink)	100/100 Mbps	500/500 Mbps	1/1 Gbps		
Jamestown Networks		Quotes given for Institutional and business uses				
NoaNet		Quotes given for Institutional uses				

Anchor Institutions

The process for identifying Anchor Institutions and then reaching out to them for facility and networking information was similar to the process described above for Broadband providers. We again relied on the members of the Community Broadband Team to obtain contacts for each Anchor Institution and adjusted these contacts as needed to ensure the best level of information regarding facility locations, network connectivity, provider(s) and speeds. In some cases, the contacts at given Anchors did not know details such as the speeds being provided. The information obtained is contained in Exhibit C, and the locations are shown in Table 2 below.

Table 2: Identified Anchor Institutions and Facilities

Facility Name	Facility Address
Beaver Sheriff Office	196283 Highway 101, Forks
CCSO Evidence	703 E Front St, Port Angeles
Central Office	13193 Hwy 112, Sekiu
Clallam Bay Branch	16990 Highway 112, Clallam Bay
Clallam Bay Sheriff Office	663 Frontier Street, Clallam Bay
Clallam County Courthouse	223 East Fourth St, Port Angeles
Crescent School District	50350 Highway 112, Joyce
Fairgrounds	1608 W 16th St, Port Angeles
Fire District 3	323 N 5th Ave, Sequim
Forks Branch Library	171 Forks Avenue South, Forks
Forks Community Hospital	530 Bogachiel Way, Forks
Forks District Court (II)	502 E Division Street, Forks
Forks HHS	140 C ST, Forks
Forks Road Shop	51 Bedrock Road, Beaver
Greywolf Elementary School	171 Carlsborg Rd, Sequim
Guy Cole Event Center	202 N Blake Ave, Sequim
Helen Haller Elementary	350 West Fir St, Sequim
Jamestown Family Health Clinic	808 N 5th Ave, Sequim
John Wayne Marina	2577 W Sequim Bay Rd, Sequim
Juvenile and Family Services	1912 W 18th St, Port Angeles
K-12 Clallam Bay School	16933 Hwy 112, Clallam Bay
LaPush PD	1472 Ocean Dr, La Push
Lower Elwha PD	341 Spokwes Dr, Port Angeles
Neah Bay	3560 Deer St, Neah Bay
North Olympic Healthcare Network	240 W Front St, Port Angeles
Olympic Peninsula Academy	400 North 2nd Ave, Sequim
OMC (Olympic Medical Center)	939 Caroline Street, Port Angeles
OPNET	110 S Penn St, Port Angeles
Pencom	321 E 5th St, Port Angeles
Peninsula College (Forks/West End)	481 South Forks Avenue, Forks
Peninsula College (Main Campus)	1502 E Lauridsen Blvd, Port Angeles
Port Angeles 3rd Street HHS	111 E 3rd St, Port Angeles
Port Administration Office	338 W First St, Port Angeles
Port Angeles Boat Haven	202 N Cedar St, Port Angeles
Port Airport Industrial Park	South O St, Port Angeles
Port Angeles City Hall	321 E 5th St, Port Angeles
Port Angeles Fire Department	102 E 5th St, Port Angeles
Port Angeles Main Library	2210 South Peabody Street, Port Angeles
Port Angeles Road Shop	1033 W Lauridsen Blvd, Port Angeles
Port Composite Manufacturing Campus	2138 West 18th St, Port Angeles
Port Marine Terminal	202 N Cedar St, Port Angeles
Sequim Branch Library	630 North Sequim Ave, Sequim

Facility Name	Facility Address
Sequim City Hall	152 W Cedar St, Sequim
Sequim District Office	503 North Sequim Ave, Sequim
Sequim High School	601 North Sequim Ave, Sequim
Sequim James Center for the Performing Arts	202 N Blake Ave, Sequim
Sequim Middle School	301 West Hendrickson, Sequim
Sequim Middle School	301 W Hendrickson Rd, Sequim
Port Williams Pump House	381 Port Williams Rd, Sequim
Sequim Re-use Center	202 N Blake Ave, Sequim
Sequim Road Shop	1453 W Washington, Sequim
Sequim Transit Center	190 W Cedar St, Sequim
Sequim Wastewater Reclamation Facility	247 Schmuck Rd, Sequim
Sequim Well	124 W Silberhorn Rd, Sequim
Sequim Well	551 Reservoir Rd, Sequim
Sequim Well	702 Port Williams Rd, Sequim
William R. Fairchild International Airport	1402 Airport Rd, Port Angeles

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Roadmap

The initial assessment allowed CBG to create a draft "Roadmap". Specifically, the roadmap was developed to show the Project's intended path from the inception of the Community Broadband Team all the way through to the presentation of the final report, which would identify feasible ways to meet the State's broadband development goals and achieve the Vision for Clallam County. The Roadmap is shown below in Figure 2 and also in Exhibit D.

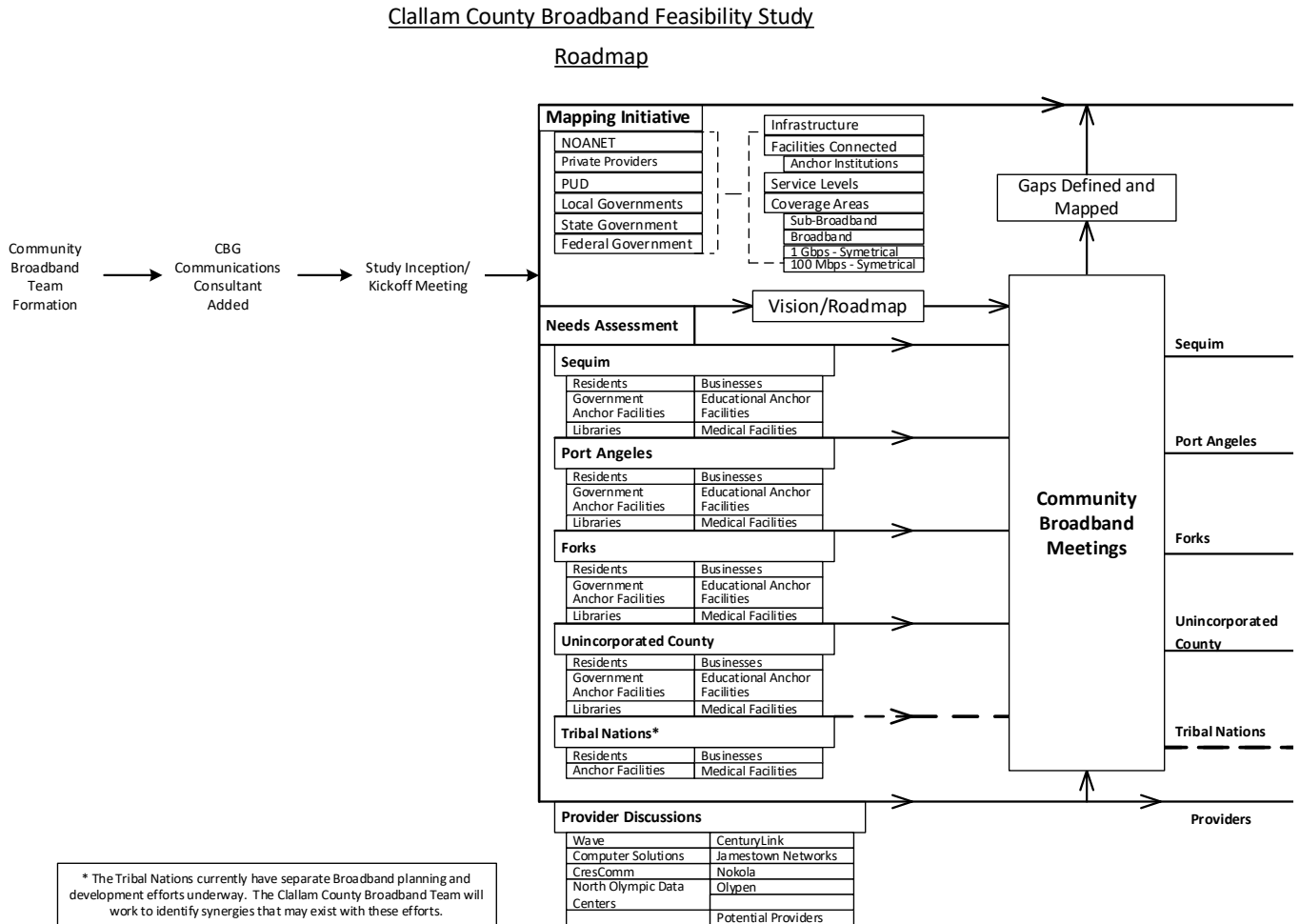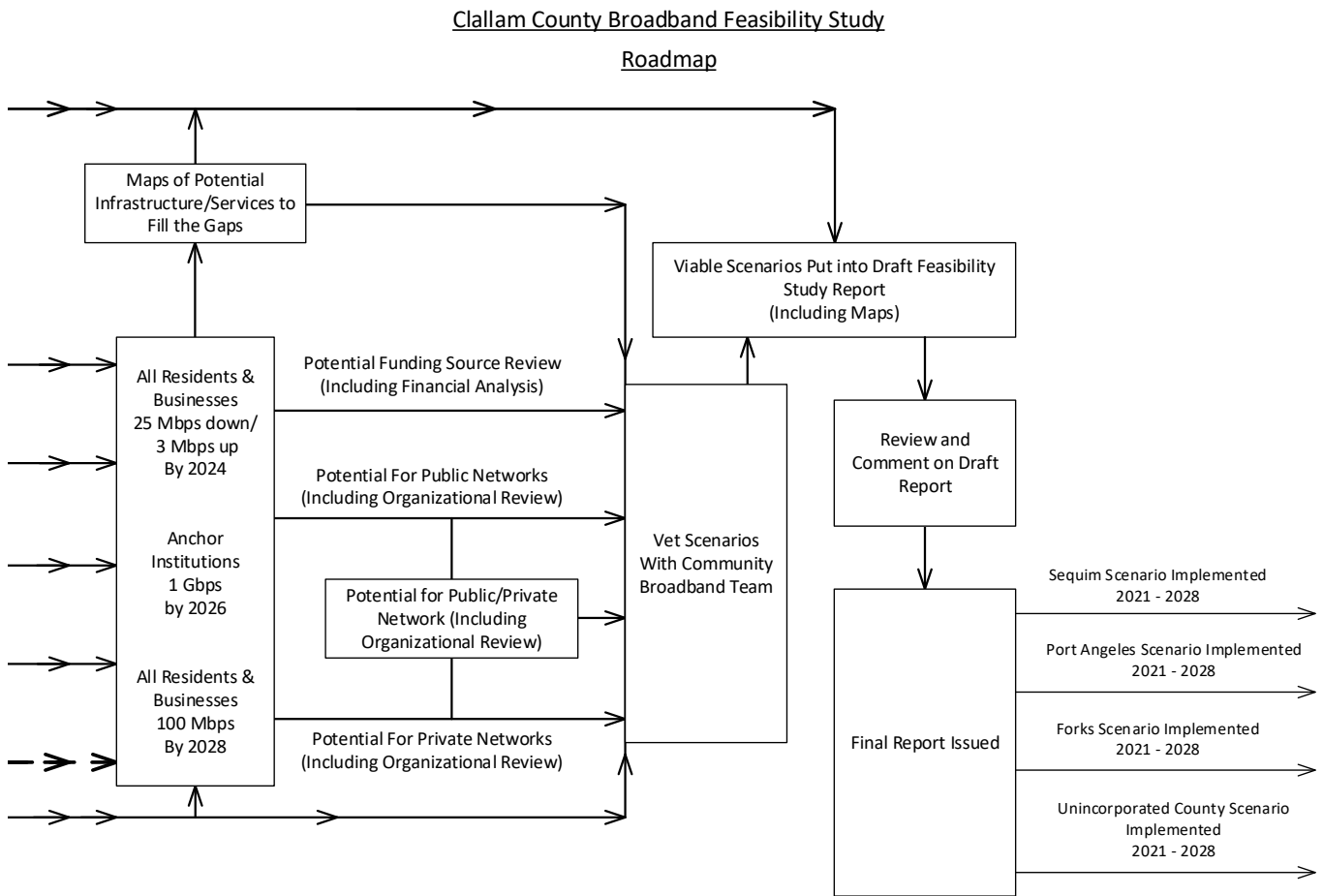Figure 2: Clallam County Broadband Feasibility Study Roadmap

Clallam County Broadband Feasibility Study
Roadmap

Figure 2 (cont.): Clallam County Broadband Feasibility Study Roadmap

Clallam County Broadband Feasibility Study
Roadmap

As you can see from reviewing Figure 2 and as discussed above, the next step after the initial assessment, in order to get a more detailed assessment, was to meet with all of the infrastructure providers (entirely virtually as it turned out) and gather information from all the pertinent anchor institution representatives and the broadband service providers in the County. This would then lead to a variety of subject matter discussed at the Community Broadband Team meetings. Then, information gained during the Needs Assessment would lead to development of a number of broadband expansion scenarios, including a variety of different operational scenarios (a public model; a public/private partnership model; and a private broadband development model). These scenarios would then be vetted by the Broadband Team, an initial draft report would be published and then this draft report would be vetted by the public before finalization.

The draft Roadmap was presented to the Team and some modifications were made before publishing it (again through various media, including the Team's website and presentation and discussion at the Community Broadband Meetings). One modification was to include the Tribal Nations in a "dotted line" fashion. Specifically, this meant that the grant funds for development of the project did not include review of all the initiatives that the Tribal Nations within the boundary of Clallam County were pursuing, because the Tribal Nations were pursuing their own studies, pilot projects and other broadband enhancement

efforts. It was determined, though, that CBG should gather information related to the activities being undertaken by the Tribes, so that where there were common pursuits, the Tribal Nations could leverage the efforts of the County and vice versa.

Once the Roadmap was published, the Needs Assessment process began.

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Section 3 - Broadband Needs Assessment

SECTION 3 - BROADBAND NEEDS ASSESSMENT

The Broadband Needs Assessment portion of the project was structured along several lines of inquiry, including:

- Results of the Washington State Broadband Speed Test for Clallam County

- Information obtained at three Community Broadband Team meetings – one hosted by Sequim focusing on the eastern portion of the County; one hosted by Port Angeles focusing on the central portion of the County; and one hosted by Forks focused on the western portion of the County

- An online Community Broadband Survey, and

- Anecdotal evidence obtained through emails sent to the Team through the Team's website and information provided throughout the course of the project from Broadband Team members, anchor institution representatives and other residents and businesses.

Development of the Clallam County Broadband Team Website (Including the Community Broadband Team Logo)

It was suggested during one of the early Community Broadband Team meetings that the Team develop a website to both provide promotion of the various events, activities, and published materials developed and sponsored by the Team, as well as to provide access to these materials through links from the website.

A logo was developed for the Team so that anything sponsored by the Team would be easily recognizable. As discussed earlier, the Team's website is a subpage of the North Olympic Development Council website and is found at https://www.noprcd.org/clallam-broadband-team. It provided access to the public for review of the Vision Statement and Goals, as well as a description of, and link to, the Broadband Feasibility Study Roadmap.

It also provided access, as did other materials, to the State's Broadband Speed Test.

Washington State Broadband Speed Test

As part of the Clallam County Feasibility Study Project, the State of Washington wanted to ensure that residents and businesses of the County were aware of the ability, and encouraged, to take the State's Broadband Speed Test during the project. The Speed Test went through various iterations, but currently is available from the Washington State Department of Commerce's Website related to bridging the gaps in broadband in Washington, at https://www.commerce.wa.gov/building-infrastructure/washington-statewide-broadband-act/

The Statewide Broadband Access and Speed Survey is a two-step process that requires entering address location data and then taking the test and viewing the results.

Promotion of the State Broadband Speed Test by the Team began right after the initial kickoff meeting and continued all the way through the Community Broadband Meetings in late October

and during the implementation of the Community Broadband Survey through the end of 2020 and early 2021.

CBG and the Team worked with the State to obtain the speed test and location results for Clallam County residents and businesses. These were entered in as metadata and then plotted on the maps showing broadband or greater speed areas; areas with Internet access but not achieving broadband speeds; and areas with no service (except for possible dial -up connections).

The State's Broadband Speed Test data is important because the data available at the Federal level (from FCC Form 477) indicates that broadband is available to an entire block, when it may only be available to one household within that block. This is not granular enough to tell the true lines of demarcation between areas that have broadband availability vs. areas that don't. The speed test data, based on real world speed test results, provides a more accurate view of any given geographic area and where broadband infrastructure may end. The State's Speed Test data was an integral part of the information CBG and the Team used to define broadband gaps as discussed in Section 4.

Community Broadband Meetings

It was determined early on in the process that three community broadband meetings would be held and the Team representatives from Sequim, Port Angeles and Forks volunteered to be the host of these meetings, help set them up and promote attendance at them. Initially, before the extent of the pandemic was identified, it was thought that potentially these meetings would be able to be held in-person, as originally intended in the project scope of work. Subsequently, it was thought that potentially a combination of virtual and some in-person attendance could be achieved, and a number of scenarios were developed to identify mechanisms to help facilitate "hybrid" meeting solutions.

Ultimately, it was determined that the meetings would need to be held completely virtually, so their timing was moved such that detailed planning occurred in the late summer and early fall of 2020 and the meetings were held in late October 2020. Specifically, the Forks and Western Clallam County meeting was held the evening of October 21, 2020; the Port Angeles and Central Clallam County meeting the evening of October 28, 2020; and the Sequim and Eastern Clallam County meeting the evening of October 29, 2020.

The CERB requirements for use of the project grant specified a number of different types of participants that need to be invited to the meetings, as well as several lines of questioning that needed to be pursued and as much information gathered to answer these questions as possible.

Promotion for the meetings was substantial, by Sequim, Port Angeles, Forks, the County and other Team members. It included news releases, promotion on the Team's website, promotion in newsletters, promotion by media outlets including newspapers and radio, promotion at public meetings, and through word of mouth. An example of one of the invitations is found in Exhibit E.

Specifically, following the CERB requirements and working to engage as wide a community segment as possible, invitees and subsequent attendees, included:

- Local Government representatives, including staff and elected officials of the sponsoring cities and the County

- PUD representatives

- Port representatives

- Business organizations and individual businesses

- Higher Education (Peninsula College) representatives

- Library representatives

- K-12 School District representatives

- The NODC

- Service provider representatives

- Hospital and medical representatives, and

- Members of the general public

A core group of attendees (representing anchor institutions, providers and business organizations) were "panelists" in the virtual meetings, with other attendees engaged as participants through the chat functions of the video conference platforms or brought up to the panelist level during the discussion. The recordings of all three meetings (held via Zoom and WebEx, as well as available on YouTube and Facebook) can be found on the Team's website under Broadband Community Events. An example of one of the PowerPoint discussion guides used for the Sequim Community Broadband Meeting is available in Exhibit F.

The facilitators for each meeting included the Team member from the jurisdiction hosting the meeting, the Executive Director of the NODC, CBG staff members and Constance Book, PhD, who has worked on this project with CBG as one of the key researchers. She has a broad background in digital inclusion and digital equity initiatives, and the uses and applications of broadband and Internet. As noted above, in each case, a panel of local stakeholders was invited as panelists to ensure diverse representation of the core constituent groups.

Initial discussion centered around reaction and response to the Team's Vision Statement and Goals, and the Broadband Feasibility Study Roadmap. Participants were then asked about their experience with existing broadband services in the particular area of the County that was being focused on, and whether existing broadband for them met their needs. If the answer was no, they were then asked where does it fall short? At this point, if they hadn't already done so, they were encouraged to take the State Broadband Speed Test to document their specific case. After this, participants were asked if they do have broadband, how do they use it now. A portion of this part of the meeting focused on critical applications in response to the COVID-19 pandemic, including telehealth/telemedicine, telelearning/tele-education and telework.

To encourage brainstorming, especially by the organization representative panelists, and to obtain reactions of participants from the general public, a number of forward-looking subject areas were explored, including:

- Cooperative efforts that could be developed

- Potential technologies for broadband expansion

- Business cases that would need to be made, and what participants thought about demand, price points per service, adoption-related issues and potential funding sources

Participants were then asked to continue to provide input into the process including to help vet scenarios and proposals put forward in the process, and to subsequently support the common goals determined; essentially, they were encouraged to become actively involved in the broadband expansion and enhancement process.

Participants were also asked to take the Community Broadband Survey that had been developed and posted on the Team's website. They were further asked to encourage others to participate in the survey as well.

Community Broadband Survey

Although not part of the original project Scope of services, it was determined that a good way to get more input from the residential community at large and additional individual businesses would be to develop an online survey. The questions on the survey again followed the lines of inquiry related to the CERB requirements. Specifically, questions in the survey focused on the following subject areas:

- Where the resident lives or where the business is located (this included zip code, and if they also chose to provide: their street, neighborhood, city or other area of the County). Similar to the data obtained from the State related to Speed Test Results, this location data, and related data on broadband provider and speed, enabled the information from many of these survey respondents to be placed on the maps.

- Availability of Internet access at their home or business

- Reasons for not having Internet access

- Availability of broadband

- Reasons for not having broadband

- Service providers that they have, as well as service providers that are available to them

- Whether their broadband service meets their current needs, and if it doesn't meet their current needs, why not

- How they use broadband or Internet access

- Looking forward, the most important aspects of broadband and Internet access for them in the future

The survey was distributed directly through a SurveyMonkey link that was promoted through a variety of the same means that promoted the Community Broadband Meetings, including the Team's webpage link.

It was also provided in a hard copy word and fillable PDF versions for those whose Internet access was intermittent or slow enough that it created problems with filling out the survey online. These versions were subsequently coded into the SurveyMonkey database. By the time the survey was closed February 28, 2021 there were 368 respondents. These respondents were spread throughout the County, but many were in and around Port Angeles and Sequim. The zip code data below shows the distribution of the respondents.

Table 3: Zip Codes for all Survey Respondents

Zip Code	Responses	Percentage
98382	148	40%
98363	103	28%
98362	96	26%
98331	13	4%
98305	3	1%
98326	2	0.5%
98381	2	0.5%
98636	1	0.3%

Ninety-three percent (94%) of the respondents were residents, with approximately 5% business and non-profit owners, including those that have home-based businesses, and the other 1% included public employees. The complete survey results are included as Exhibit G. Some of the key findings from the survey are the following:

- **Internet Access** – 94% of the respondents indicated that they have Internet access at their home or business. Of the 6% who do not have Internet access, the primary reason is that it is not available in their area. This was followed by "can't get the kind of service that I need" and cost reasons. For those who indicated other, it included responses such as: "the only thing available was Dial-Up and I do not have a landline"; "only available via mobile phone hot spot" and "I have the option of going satellite Internet, which varies day to day based on speed".

- **Broadband Availability** – While the majority have Internet access, far less have broadband. Specifically, 56% of respondents indicated that they have a broadband service at their home or business (defined by the State, FCC and in the survey as a minimum of 3 Megabits per second upload/25 Megabits per second download). This left 35% that indicated that they did not and 10% that did not know whether they have broadband speeds or not.

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Figure 3: Broadband Services at Home or Business
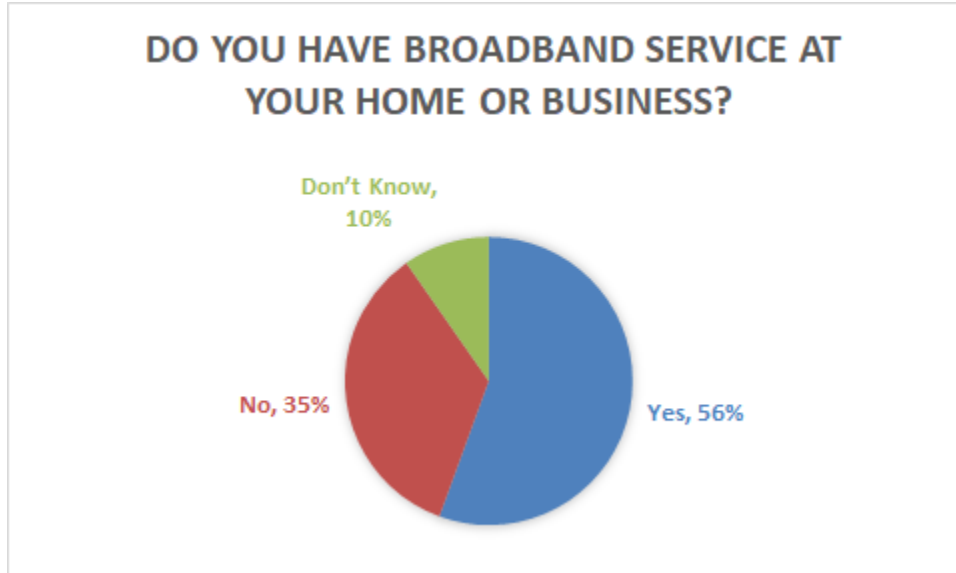
For those that do not have broadband, the number one reason is that it is not available in their area, followed by "my Internet service cannot provide broadband speeds". Only 13% indicated that cost was an inhibitor to obtaining broadband. Sixteen percent (16%) of respondents indicated other reasons as well, including "the current provider said that they have broadband, but the actual speeds are far less, if nonexistent"; "we only have satellite available in our area which is very slow and does not always work"; "the cable that runs into our house is outdated, VERY outdated" and "we get 0.5 Megabits, much worse than most third world countries".

When specifically looking at Business respondents to the survey, 20% indicated that they did not have Broadband service at their business. The top two answers for not having Broadband at their business was "Not available in my area" and "My Internet service cannot provide Broadband speeds." Both categories were equally selected by 60% of businesses without Broadband services.

● **Service Providers** – The prominent providers for survey respondents were CenturyLink, followed closely by Wave, with a variety of other providers (primarily fixed, cellular and satellite wireless) also indicated.

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Table 4: Survey Respondent Broadband and Internet Access Providers

Providers	Response	Percentage
Wave	123	37%
CenturyLink	124	37%
CresComm	1	0.3%
Nikola	21	6%
OlyPen	18	5%
HughesNet	10	3%
Wild Blue /Viasat	6	2%
Verizon Wireless	13	4%
AT&T Wireless	5	1%
T-Mobile/Sprint	1	0.3%
Dish	4	1%
Don't Know	1	0.3%
Other (please specify)	10	3%

Many of the respondents indicated that there was more than one provider available to them, with nearly two-thirds listing CenturyLink. Some respondents provided additional information including "technically all of them, but they all have poor performance because of the outdated cable" and "I don't think we have any wire Internet service in this area; I've had Dish Internet but it was too expensive due to data limits"

● **Current Needs –** The majority of respondents indicated that their current broadband service/Internet access does not meet their needs, with 57% indicating "no, it does not"; 42% indicating "yes, it does" and an additional 2% indicating they don't know.

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Figure 4: Does Broadband Service/Internet Access Meet Your Needs?
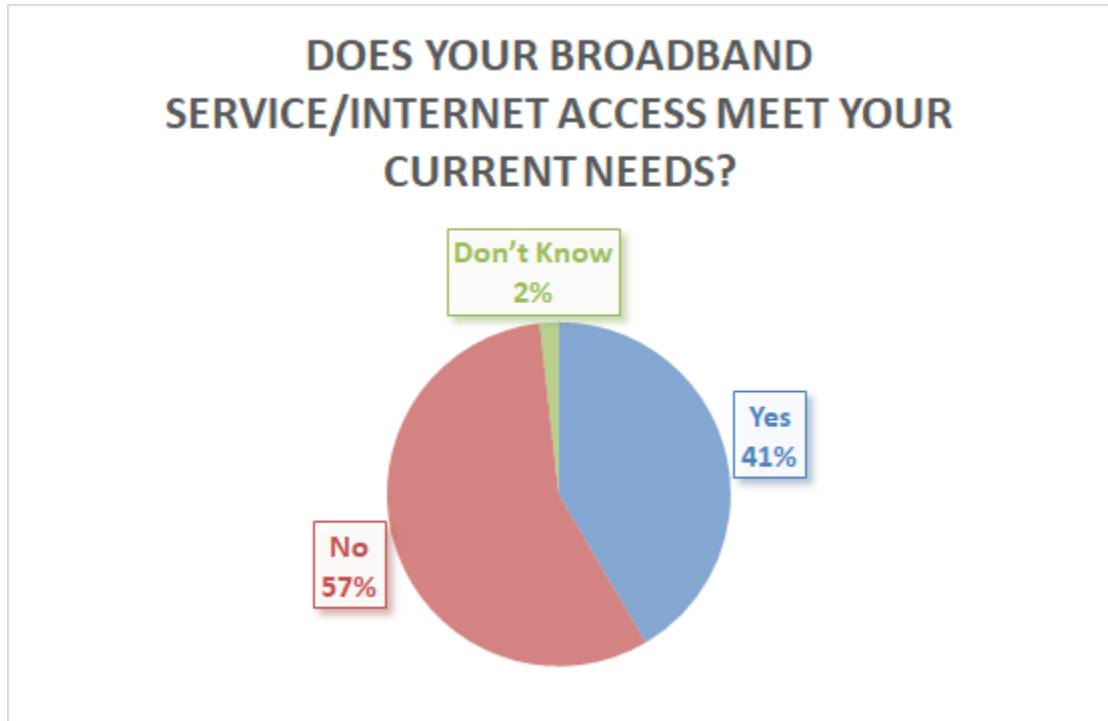
The single biggest reason is that their broadband service/Internet access is "too slow" (87%), followed by "unreliable" (57%), and that "their Internet service is inadequate" (55%). The fourth largest reason is that they "only have one provider available to them. They'd like to have a choice" (35%), and the fifth is that it is too expensive (at 32% of respondents).

Figure 5: Reasons Broadband/Internet Does Not Meet Your Current Needs
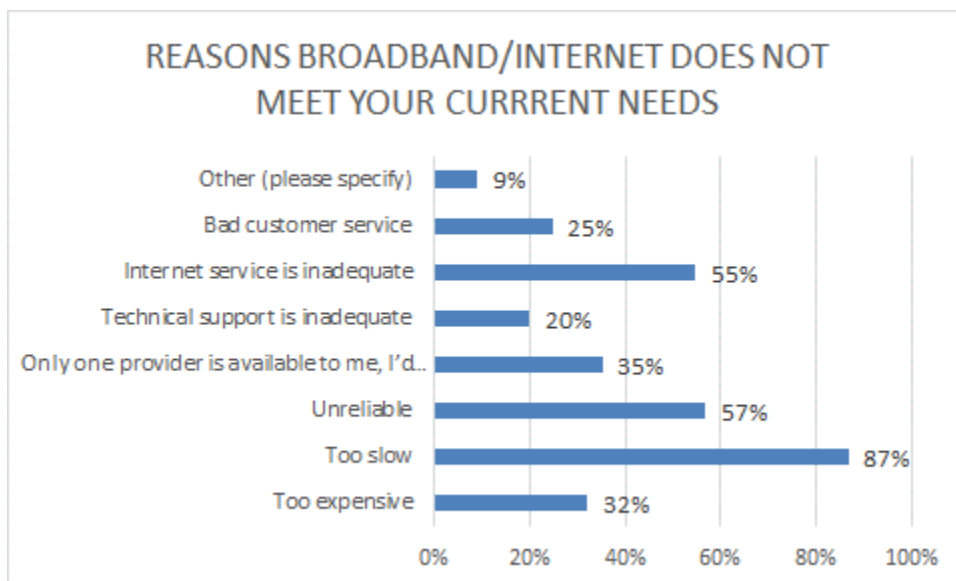
When looking again specifically at those who indicated they were a business or a home-based business, we find 67% of Business respondents to the survey indicated that their current Broadband and/or Internet service did not meet their current needs. The top two reasons for not meeting their needs were "Too slow" (88%) and "Internet service is inadequate" (63%).

- **How broadband/Internet access is used by residents and businesses** - The top three overall reasons for utilizing broadband/Internet access include: researching retail prices and product information, as well as purchasing goods and services and communicating with family and friends. These were followed by online banking, getting news and retrieving local business information and medical information/telehealth/telemedicine.

  Education purposes like remote learning also comes in as a substantial reason, with telework (working from home) now specified by the majority of respondents. The chart below shows the full range of activities and the percentage of respondents that utilize their broadband or Internet access for these activities.

Table 5: How Survey Respondents Use the Internet

Activity	Yes	No	Don't Know	N/A
Research retail prices and product information	98%	2%	0%	0%
Purchase goods and services	97%	2%	0%	0%
Keep in touch with family and friends	97%	3%	0%	0%
Online banking	95%	3%	0%	1%
Get local news	95%	4%	0%	1%
Retrieve local business information	95%	4%	0%	1%
Watching television or other videos	93%	7%	0%	0%
Retrieve medical information / telehealth / telemedicine	91%	7%	1%	1%
Share photos	89%	9%	1%	1%
Visit my local government's website	87%	10%	1%	2%
Education purposes, like remote learning	83%	15%	0%	2%
Find local, state or federal social services and government assistance, such as social security and housing	77%	20%	0%	3%
Find legal information	73%	23%	1%	3%
Contribute to a website, blog, or other online forum	63%	31%	1%	4%
Make telephone calls	60%	37%	1%	1%
Work from home (telework)	58%	37%	0%	5%
Retrieve local school information	52%	32%	0%	15%
Play video games	49%	48%	1%	2%
Sell goods or services	44%	47%	1%	8%
Support my home-based business	32%	53%	1%	14%
Language translation	32%	61%	1%	6%

For Businesses, the top six categories selected for how they use Broadband or Internet access were: retrieve local business information; watching television or other videos; visit my local government's website; get local news; education purposes, like remote learning; and find legal information. Each of these categories were selected by 90% or more of the businesses as to how they use their Broadband or Internet Access.

● **Most important future aspects of broadband service/Internet access** - For all respondents with access to the Internet (whether broadband or sub-broadband), speed of connection, reliable access to the Internet, and cost of service were the top three most important future aspects. However, when only looking at those with just Internet access, the third highest concern was "having broadband available in their area" and replaced cost of service (which came in fourth). This indicates that while cost remains a substantial consideration, respondents are willing, if they can get reliable high-speed access to the Internet, to invest in obtaining broadband.

When specifically looking at survey respondents who identified themselves as a Business, we find that they also reported that the most important aspects of Broadband service and Internet Access for their future are "Speed of the connection" and "Reliable access to the Internet". Each of these categories was selected by 96% of the business respondents.

Key Considerations Concerning Broadband/Internet Access Needs in Clallam County

An analysis of all the data gathered during the Needs Assessment phase of the project shows six key considerations when looking at the feasibility for expanding and enhancing broadband in the County:

● **Having a connection to the Internet with at least minimum Broadband speeds is critical for the vast majority of residents and businesses in Clallam County** – During the Community Broadband Meetings, in responses from the Community Broadband Survey, in associated emails, in interviews and from other anecdotal evidence, Clallam County residents with high speeds of connection discussed the importance of such speed to them. It facilitates all the online activities that they currently engage in, including those that are critical today based on COVID-19, such as telehealth, tele-education and telework. Conversely, those that do not have necessary speeds of connection, also discussed the importance of such speeds, but directly pointed out the negative impact of not having such speeds of connection and provided examples of what they were not able to do (e.g., can't engage in tele-learning activities from home; have to drive to locations with public access to the Internet in order to learn or work on line; not able to participate in telehealth, either from the health provider's or the patient's perspective; etc.).

All in all, speed of connection with at least minimum Broadband speeds is the number one thing that those without Broadband (over 1/4 of the homes in the County), want

those who are focusing on expanding and enhancing Broadband to achieve in the County.

● **Reliability is also critical** – Many of the participants in both the Community Broadband Meetings and in the survey, and from information obtained from other outreach efforts, discussed that reliability of connection is almost, if not equally important, in what they need at both their homes and businesses. Respondents discussed, for example, sometimes being able to get Broadband speeds and sometimes not; not being able to achieve Broadband speeds "when everyone in the neighborhood was online", meaning that contention for access to the network is a problem; others talked about unreliable infrastructure and "bad cable"; still others talked about "promised speeds" that were never delivered.

This means that just as important as having a high-speed connection, residents and businesses in Clallam County need to be able to count on that connection at all times, regardless of the number of users. Some of this will relate directly to the bandwidth that is available and how that bandwidth is shared based on the technology facilitating their particular service; some is related to the fact that more people are simultaneously online in the household (i.e., teleworkers, students and those accessing entertainment and gaming, based on COVID-19 Stay-at-Home Orders and advisories), but some of it is based on aging infrastructure as described below.

● **Aging Broadband/Internet infrastructure is a problem** – It is evident, based on the information received, that, especially for those that have DSL connections, aging copper infrastructure, not only distribution infrastructure, but copper up to and inside the home, is creating problems. In some cases, based on speed tests and associated information, literally neighbors may have a completely different DSL experience as far as both speed of connection and reliability. This is shown on the points mapped for both the State Speed Test results and the respondents reported speeds through the Community Broadband Survey.

Wave Broadband subscribers also reported issues with speeds varying with simultaneous use by members of the household and multiple simultaneous user households in the neighborhood, but some also suspect aging cable infrastructure here, as well. This is conceivable, based on the fact that Wave has acquired older systems dating back to infrastructure placed in the 90's in order to provision its system in the eastern and central part of the County.

What this means is that not only expansion of Broadband is needed, but enhancement of existing systems is needed as well. Such enhancement, if properly provisioned, will not only enable meeting the minimum State Broadband speed goals by 2024 but also help meet the 2028 goal of 150 Mbps symmetrical service for residents and businesses.

● **Many of those both with and without access are willing to pay a premium to achieve continuously reliable, high-speed Internet service, but the cost still must be affordable (in other words, not outrageous, extraordinarily high or astronomical)** – Evidence from the Community Broadband Meetings, interviews,

emails and the responses from the surveys all point to cost as a third or fourth adoption consideration and need behind speed and reliability, showing that people understand the cost/benefit of achieving reliable high-speed Internet access, but affordability is still a big concern. A deep dive into the information shows that when there is a high cost of connection (especially a high installation cost) and then fees that exceed monthly household budgetary allowances in consideration of other essential utility services and basic life needs (such as power cost or food, clothing, shelter, etc. costs), broadband is then not affordable, even in the face of critical needs for teleworking, tele-education or telehealth. Moreover, if these critical needs are not evident (such as for retirees in good health) many may be willing to live with slower Internet access. This is pointed up, for example, by those inside of areas where Broadband is readily available (such as in Sequim and Port Angeles), but have chosen lower cost DSL instead of cable-modem based Broadband services. This is also true, when looking at the criticality of high-speed services for businesses, where businesses will look at their bottom lines before choosing a lower cost service, such as currently DSL vs. a substantially higher cost, fiber-to-the-premises service.

What this means, is that in areas where an expansion of infrastructure is needed to bring Broadband services (such as beyond the limits of Sequim and Port Angeles, for example, to surrounding pockets of homes) that supplemental funding may be needed to substantially reduce the cost of construction and installation, so that residents will not have to pay extraordinary costs to obtain Broadband service (such as one resident that indicated that their cost of connection quoted from Wave was $10,000; well beyond the cost of a standard installation inside of one of the served municipalities). Once available, broadband will still need to be affordable, even considering the fact that residents and businesses have critical needs for Broadband service (the vast majority at this point). As an example, it remains to be seen whether Starlink's $499 equipment cost and its $99 per month service cost will be viewed as affordable by all who currently have substandard speeds and through Starlink may be able to increase their service to Starlink's reported 100 Mbps download/20 Mbps upload speed.

● **Numerous pockets of residents exist just outside of areas where Broadband service is available** – Responses received at both meetings and through the surveys, as well as through the State Speed Test results reveal numerous pockets of residents that are just outside of areas where service is available who desire Broadband service, but can only get sub-Broadband Internet access.

There are also far-flung households that are beyond the pockets that have the same issue.

What this means is that varying solutions will be needed in order to achieve the State's goal of making Broadband available to all of these households by 2024. Most likely, as detailed further herein, there will need to be phases of builds by different technologies in order to achieve the goal.

- **Beyond Service Availability, there are other Digital Equity issues in the County
  –** The National Telecommunications and Information Agency (NTIA) defines digital
  inclusion as an environment where all individuals have access to robust Internet
  connections, the hardware and devices needed to connect and the know-how to use
  technology in creative and productive ways that allow them to succeed in our digital
  world.[11]   In 2017, the NTIA launched a "digital inclusion" webspace that tracks
  resources and support for this vision. When considering this definition and the effort
  underway in Clallam County, we find that while important infrastructure and access
  initiatives are being pursued, the broadband environment still fails to meet the standard
  of digital inclusion as defined by the NTIA. This finding was affirmed in both
  quantitative and qualitative assessments of the broadband environment in Clallam
  County.

  During meetings with community leaders in business, education, healthcare and local
  government, they were asked about the digital inclusion environment. Several
  commented on the inability to acquire a robust broadband signal (availability and
  speed) at an affordable price. When describing these issues, the majority focused on
  the barriers that lack of availability create for individuals in the community. The
  pandemic had only amplified these issues. For example, several cited the inability to
  efficiently work remotely during the pandemic, including the inability to share large
  files with colleagues and co-workers. Others cited the inability of clients and patients
  to access services using video applications during the pandemic, forcing many to delay
  appointments and losing valuable "work time". College and K-12 school leaders
  indicated that students could not engage in synchronous classes and that lack of
  broadband meant lost time toward degree completion and education competencies.
  Using the definition of digital inclusion provided by the NTIA, one can see that the
  underserved areas of Clallam County, along with those areas that remain without wired
  connections are not in an Internet environment that allows them to succeed.

  These themes were echoed in the community broadband survey conducted with
  residents and businesses within Clallam County.   The survey, which used a
  convenience sample (N=376), was used to provide the local community an additional
  opportunity to provide observations about their experiences with the Internet in the
  County. Many of the themes focused on the environment around digital inclusion. For
  example, the primary reason provided by those that did not have broadband service
  (N=120), was that it was not available (61%) and an almost equal number noted that
  the current provider could not provide broadband speeds (58%). Cost of Internet
  service, the issue that many would consider to be the barrier to broadband adoption,
  was mentioned by 13%.

  The Clallam County community has responded to the issues of affordable Internet,
  affordable equipment, digital literacy training and public computer access in the area

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[11] https://broadbandusa.ntia.doc.gov/digital_inclusion

primarily through the efforts of the North Olympic Library System (NOLS).[12] The Director of the Libraries participated in the meetings. Four branches of NOLS operate in Clallam County. Together, these four branches provided more than 100 public computers, Wi-Fi hot spots at each of the locations, and service that provides residents technology and digital literacy training. With the advent of the pandemic, the Library Director shared how critical the "parking lot" and curbside services that allow citizens to access the Internet had become. Students turning in homework assignments and employees uploading files and conducting teleconferences were just a few of the examples provided by focused discussion participants as critical work underway in the parking lot. Of note, is that the NOLS system also engaged in laptop checkout, curbside printing and software access in response to the pandemic. These efforts are in place as a way to create a more digitally inclusive environment in Clallam County.

In addition to the NOLS system, several businesses and the Clallam County PUD are supporting public Wi-Fi hot spots in the area.[13] These are mapped by the state of Washington's Department of Commerce and include everything from the JC Penney parking lot to downtown Wi-Fi corridors. While normally one considers digital inclusion to be tied to goals related to education, business or healthcare; it was clear in the Community Broadband Survey and during meeting discussions that many members of the Clallam County community tie digital inclusion to general well-being. One respondent indicated that access to high-speed Internet service "kept her sane" and another described being able to access the information and resources that directly impacted their quality of life. These sentiments lend to the finding that Clallam County residents are experiencing barriers to the quality of life that a fully digitally equitable environment would allow them to have. A recent study by the Pew Internet and American Life Project[14] also found that, during COVID-19, the more urban, college-educated and younger leveraged their broadband capabilities to maintain social contacts, work from home and shop. Maintaining these lifestyle assets during COVID-19 were significantly less likely among the older, less educated and rurally-located residents. Clallam County has many that are part of the latter group.

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[12] https://www.nols.org/all-services/
[13] https://clallampud.net/community-wi-fi-hotspots/
[14] https://www.pewresearch.org/fact-tank/2020/04/30/from-virtual-parties-to-ordering-food-how-americans-are-using-the-internet-during-covid-19/

Section 4 - Broadband Assets and Maps

SECTION 4 - BROADBAND ASSETS AND MAPS

Broadband Assets and Maps

Once the Needs Assessment was completed, and following the Roadmap, CBG and its team partner GeoDecisions, along with additional vetting and input from the Team, were able to develop a Broadband/Internet Access Asset Inventory and a variety of different Broadband Availability maps. These are described and shown both below and in Exhibits H and I.[15]

Asset Inventory

We began the process of identifying physical assets by holding a discussion with the Clallam County Public Utility District (PUD). The PUD provided us with a map layer showing all of its poles throughout the County. This provided a path to virtually every home in the County that is served by the PUD. We also reached out to all known broadband and Internet providers to garner each of their physical assets in the County, with mixed results.

One category of physical assets are those categorized as wireline infrastructure. This includes fiber optic cables, twisted pair or copper phone wires and coaxial cables used in Hybrid Fiber Coaxial (HFC) cable TV networks.

Again, the PUD provided detailed mapping information showing its fiber optic infrastructure throughout the County in both aerial and underground deployments. Although multiple inquiries were made, CenturyLink did not provide any type of asset inventory to us, but did ultimately provide a coverage map showing where it can provide Internet service to residents and businesses.

Wave Broadband provided a map showing where its fiber optic infrastructure is located in and around Port Angeles and Sequim. It did not provide any information of where it has coaxial cables, which provides the "last mile" of connectivity for its customers. In a later discussion, it was found that its maps, at the coaxial infrastructure level, are likely not completely accurate based on the lack of accurate documentation by the previous owner of the assets.

The three primary fixed wireless service companies provided various levels of information on their infrastructure. CresComm provided coverage maps of its service areas but did not want to provide the locations of its towers in the County. Nikola provided addresses for its towers and radio locations but asked that exact addresses not be used. In addition, Nikola provided coverage maps for its network and the frequencies and associated capacities of radios deployed in its footprint. We made contact with OlyPen a number of times and agreed on the company providing coverage

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[15] In a typical Broadband Feasibility Study, as indicated in the Introduction and Background Section, some of this information would be gathered on-site and through observation by CBG staff, as well through in-person audits and tours of facilities and infrastructure. Do to COVID-19 protocols, during the entirety of the project, CBG staff were not able to make on-site visits to Clallam County. Accordingly, it will be noted in this section where any information was not able to be obtained virtually, but could have conceivably been acquired on-site, and that on-going, post-pandemic efforts by the Team members to implement the scenarios in this report will be able to add to the dataset as needed going forward.

maps of the areas it serves with wireless service. Despite these discussions and e-mails, we have not yet received this information.

Note that the companies providing services using CenturyLink, Wave and PUD infrastructure do not own any of that infrastructure and therefore it is included, at the level provided, in each of those three entity's infrastructures.
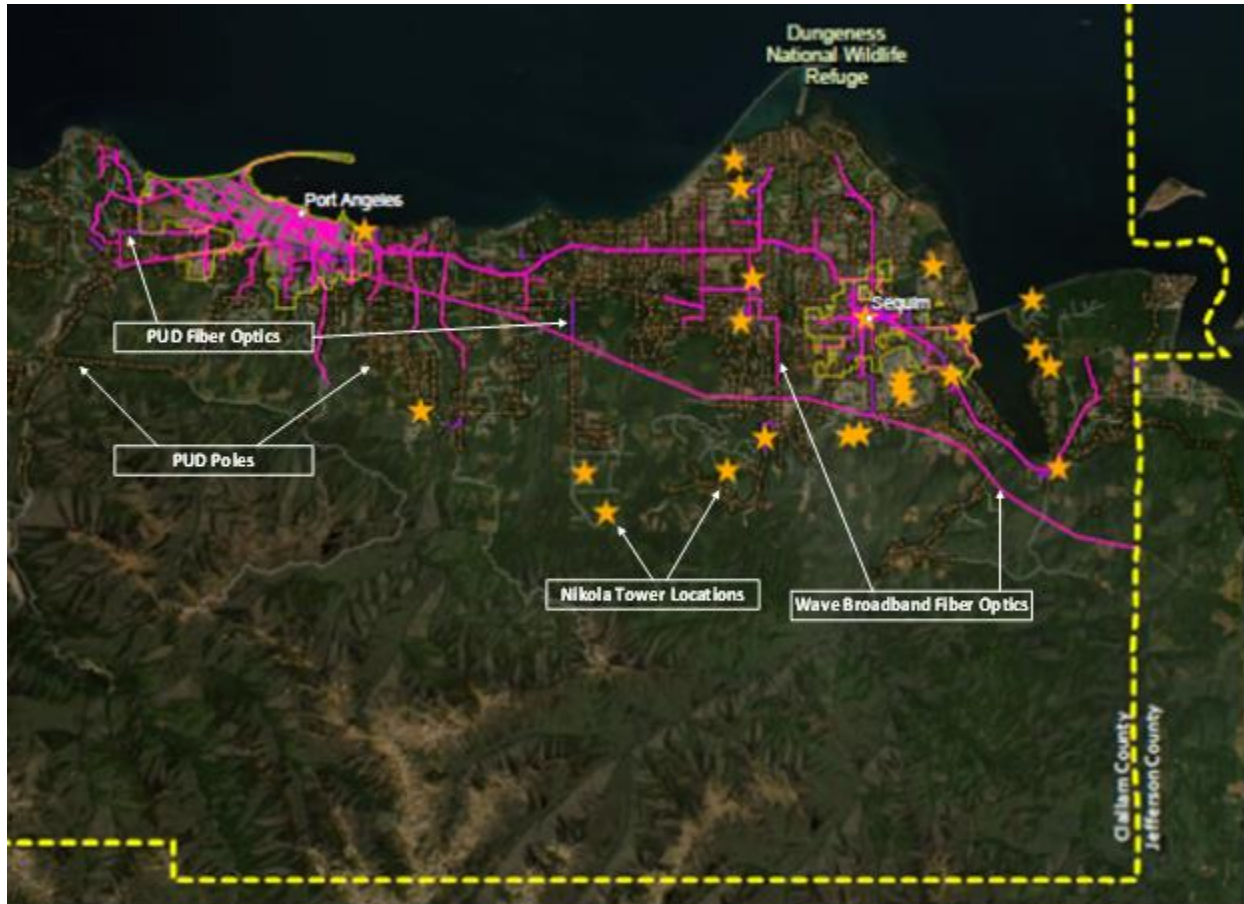
Figure 6: Nikola tower locations, PUD and Wave Broadband fiber optic cables.

The eastern end of the County has the most physical assets due to the higher level of population density. The main provider of Broadband on the eastern end is Wave Broadband. This map shows Wave Broadband fiber optic infrastructure as well as the PUD's fiber optic infrastructure. As mentioned above, Nikola Broadband provided locations for its towers and these are represented by the stars on the map above. Wireless "infrastructure or assets" are only shown on the one map above as this is everything Nikola has in the County and, as discussed above, the other two wireless providers have not provided tower locations.

Figure 7: PUD fiber optic cables.
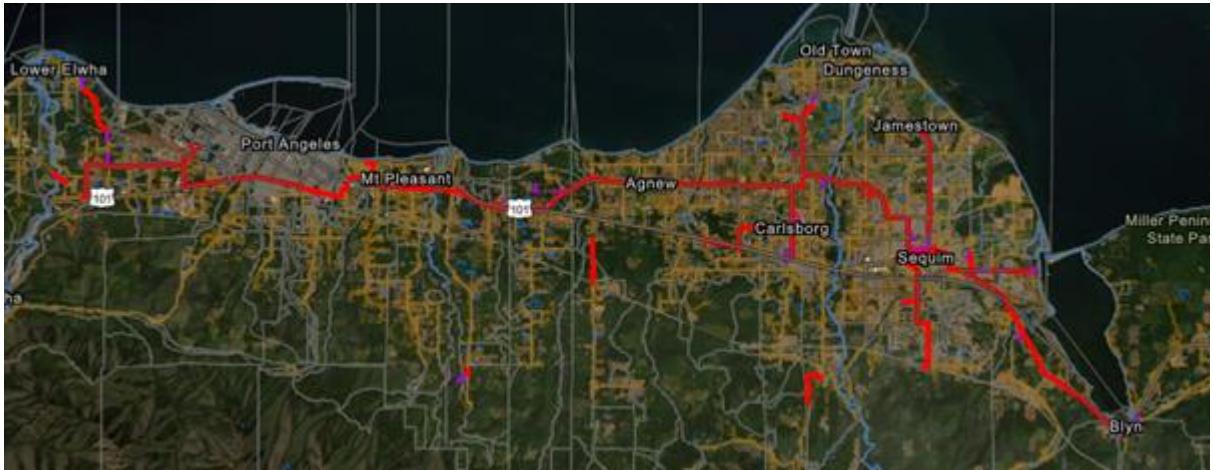
We have broken out the PUD's fiber on these two maps for clarity. It is otherwise difficult to see this infrastructure where other assets reside, such as where Wave Broadband's fiber exists on the same poles as the PUD's fibers.

Note that the red lines are aerial PUD fiber optics and the purple lines in and around Port Angeles and Sequim are underground PUD fiber optics.
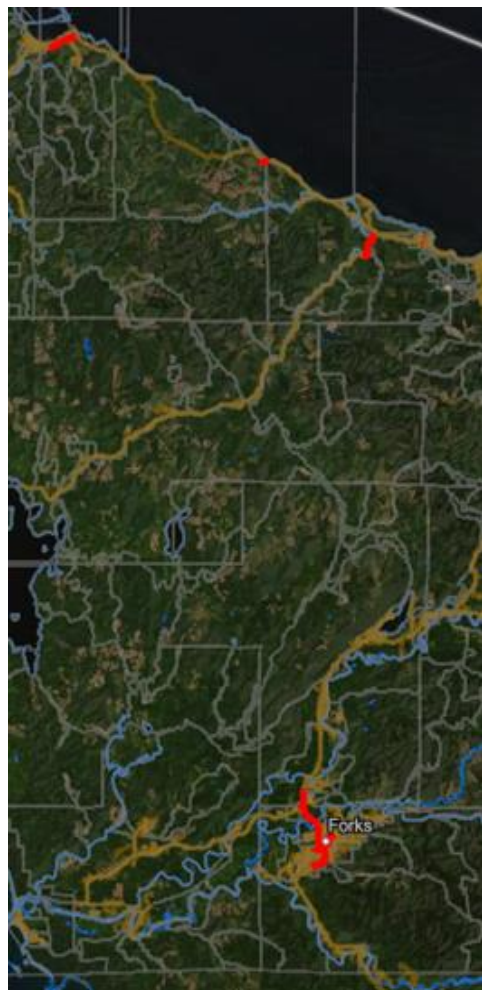
Figure 8: PUD fiber optic cables on the western end of the County.

Figure 9: PUD Poles (red poles creating lines) throughout Clallam County.

The PUD's power poles are included in most of these asset maps as brown dots, but are difficult to see because of their relative size. Here the poles are enlarged slightly and shown in red for ease of identification.

The Central portion of the County does not appear to have any significant assets outside of the PUD's poles. CenturyLink should have both fiber and copper infrastructure, and it is also likely that OlyPen and CresComm have tower locations in the central County area, but we were not provided with that information.

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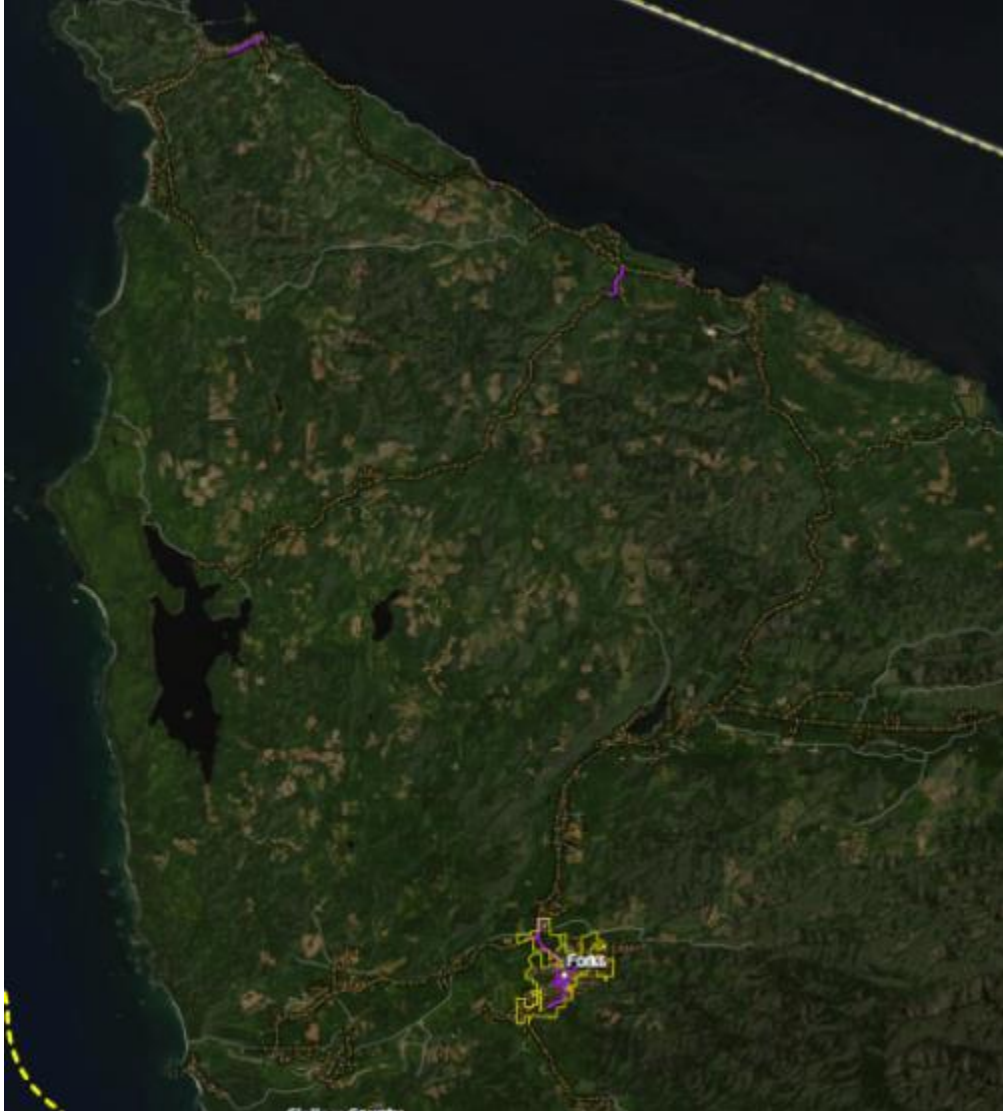
Figure 10: Lack of significant Broadband/Internet assets in the western portion of Clallam County

The western end of the County shows as having limited assets. The PUD has poles on this end of the County and some fiber optic infrastructure in and around Forks as well as in the Neah Bay area. We also know that CenturyLink has fiber optic and copper infrastructure in this, and all areas of the County but, again, we were not provided with this documentation. We know that there are fixed wireless assets in the western portion of the County as well.

Base Maps and Metadata

The above maps established a good baseline for moving forward in determining where both Broadband and less than Broadband Internet are available in the County. From this point, we added in CenturyLink's maps that show where they report being able to provide service as well as the coverage maps from CresComm and Nikola. This results in the map below:
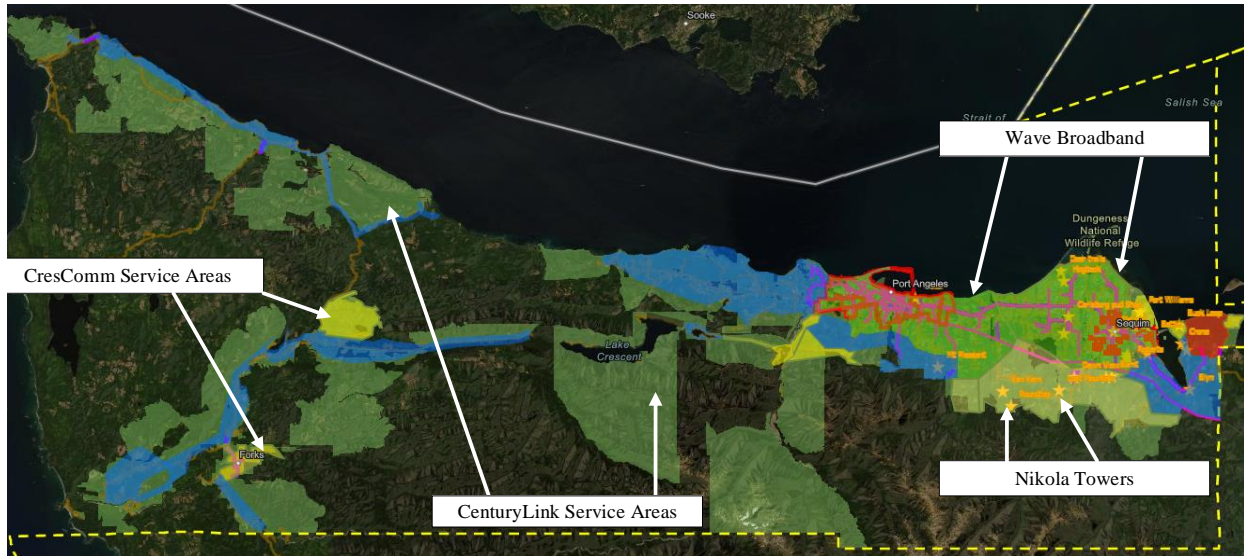
Figure 11: Providers' known coverage in Clallam County.

To this map, we added in attributes that are not infrastructure-based, but rather better define the speeds that are available in the County. It must be understood that providers often define service offerings in the form of best-case scenarios. In other words, providers often advertise speeds using "up-to" when describing speeds. Other things that can impact realized speeds, before entering the home or building include the distance and obstacles between the provider's tower and the home regarding wireless services, and distance and condition of wires between a DSLAM that CenturyLink uses to transfer between fiber optic cables and copper wires.

For these reasons, we added a layer to the map showing the results from people in the County taking the State's Broadband speed test. A survey instrument was also circulated that included the ability to provide realized speeds at specific addresses. Both of these parameters are added to the maps below:

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Figure 12: State speed test location and results.

Figure 13: State speed test location and results. Eastern Clallam County.

These maps show the locations of State Broadband speed tests at or near the address given by the person taking the test or identified by IP address.

We have placed the tests into three categories:

Green = Broadband is available at this location.

Blue = some level of Internet service is available, but measured speeds indicate the service is not fast enough to be Broadband.

Red = no available Internet service at these locations, except potentially dial-up.
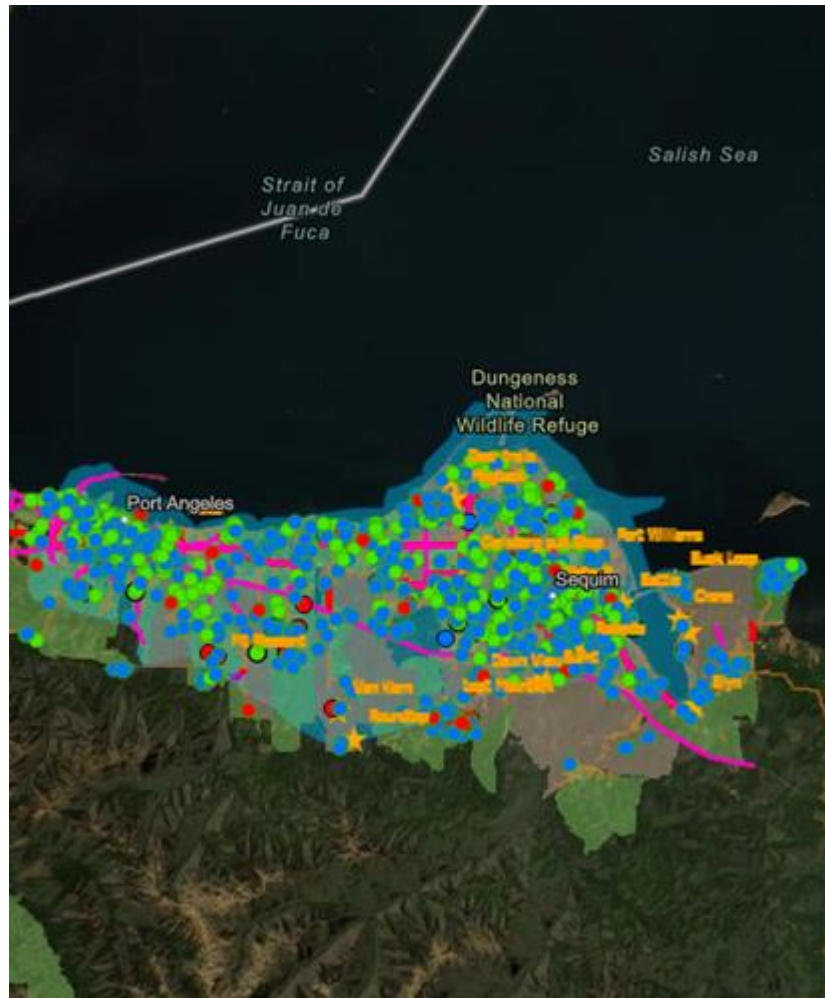
Figure 14: State speed test location and results. Central Clallam County.

These maps also show the speeds reported by some of the people that took the on-line survey. These are shown as dots with the same colors as the State Speed Tests, except these have a black circle outlining the dot.

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Figure 15: State speed test location and results. Western Clallam County.

With the above data and information inserted into GIS mapping layers, we now had the providers with technologies utilized, and speeds of each network, as well as a list of anchor institutions with known speeds to each documented and the broadband and sub-Broadband speeds as reported by the providers and the general public.

The PUD currently has a significant footprint of fiber optic infrastructure in the County with access to poles throughout the County, with the exception of inside Port Angeles where the City owns most of the poles. The PUD's model today is to provide wholesale Broadband service to third-party providers such as OlyPen, CresComm and others. These third-party providers then work with each customer to pay for an extension of the PUD's fiber to the customer's home. The PUD does not take on any debt as a result of connecting the subscriber and therefore its return on investment is nearly immediate.

Today only one provider, Wave Broadband, is well positioned to provide Broadband to every customer passed by its network. Because of the technology used by Wave, the same levels of speeds are available to all of the customers within its service area. The only significant reasons for customers to realize far lower than the advertised speeds, on a consistent basis, is that Wave

would over-subscribe a node with too many customers, or a higher-than-average number of gamers or high-throughput users are competing for the same bandwidth off of a node, or there are continuous, simultaneous high-throughput, users in the same household.

CenturyLink provides service throughout the County on a DSL platform. DSL is generally slower than cable modem Internet services and the level of service drops with an increase in distance between the company's DSLAM, the demarcation between the fiber optic infrastructure and CenturyLink's copper infrastructure, and the home. Furthermore, the quality and size of the copper wire is an important factor on how far CenturyLink can serve customers from the DSLAM and how quickly the speed of the connections drops in quality (speed).

We found, based on the speed tests and through discussions with members of the County Broadband Team that the copper wire in place in the rights-of-way likely has significant problems that have built up over time. Some of this copper plant has been in place for several decades and is degraded to varying degrees throughout the County. This is likely the reason speed tests varied from less than 1 Mbps in the forward direction to well above the current Broadband levels of a minimum of 25 Mbps in the forward direction and 3 Mbps in the return direction.

Although CenturyLink appears to provide Broadband through large areas of the County, in reality the realized speeds appear to be for less than Broadband in many of the areas served.

Again, there are three wireless/wireline providers in the County that also resell both CenturyLink services and Wave services. Their wireline services provided are largely in line with the service levels available through CenturyLink and Wave.

We ascertained that CresComm provides Broadband speeds of up-to 25/3 Mbps. Of course, as explained above, wireless signals are prone to degradation due to topographic blockages and tree cover. Both of these are of significant concern in Clallam County and create an environment where serviceability and level of service cannot be accurately determined without installing a radio to test for signal quality and Internet speeds at any given location.

Nikola provides several types of wireless network connectivity. These vary by the frequencies utilized by the transmitting and receiving antennas. Nikola uses radios operating in the 900-Megahertz (MHz) band providing up-to 6 Mbps; 2.4 Gigahertz (GHz) providing up-to 15 Mbps; 3.5 GHz providing up-to 30/10 Mbps; and 5 GHz at 30/10 or 50/25 Mbps. Nikola also offers 60 GHz service at up-to 100/100 Mbps, but this service only travels in the hundreds of feet from the tower to a customer.

OlyPen also offers wireless services. However, to date, we have not received any specific information related to the technologies used, tower locations or service levels provided.

Anchor Institutions

As stated above, we worked with local contacts to garner information about all Anchor Institutions. These included City and County facilities such as city halls, police and fire buildings, event centers, public works facilities, etc. We also gathered contacts for educational facilities ranging from elementary schools to college campuses.

Overall, the larger facilities and locations with higher demand for speed are connected to the Internet with fiber optic infrastructure. Although the speeds varied at these locations, in large part, the facilities are positioned to receive 1 Gbps symmetrical service as the need arises in the future. Simple upgrades to edge devices while working with the provider to upgrade the service level is all that should be required.

As shown below, many Anchor Institutions are connected by a third-party using PUD, Wave or CenturyLink's infrastructure.

Table 6: Known Anchor Institutions, Provider and Speeds

Facility Name	Facility Address	Provider	Down Speed	Up Speed	Technology
Beaver Sheriff Office	196283 Highway 101, Forks	CenturyLink	1.2 Mbps	5 Mbps	T1, DSL
CCSO Evidence	703 E Front St, Port Angeles	Wave	100 Mbps	100 Mbps	Fiber
Central Office	13193 Hwy 112, Sekiu	CenturyLink K-20	1 Gbps	1 Gbps	Fiber
Clallam Bay Branch	16990 Highway 112, Clallam Bay	CenturyLink	100 Mbps	100 Mbps	Fiber
Clallam Bay Sheriff Office	663 Frontier Street, Clallam Bay	CenturyLink	<1 Mbps	<1 Mbps	Dry Pair of wires
Clallam County Courthouse	223 East Fourth St, Port Angeles	Wave	1 Gbps	1 Gbps	Fiber
Crescent School District	50350 Highway 112, Joyce	CenturyLink K-20	500 Mbps	500 Mbps	Fiber
Fairgrounds	1608 W 16th St, Port Angeles	Wave	50 Mbps	50 Mbps	Provisioned Ethernet Link
Fire District 3	323 N 5th Ave, Sequim	Unsure of connection speeds and infrastructure			
Forks Branch Library	171 Forks Avenue South, Forks	Wave	30 Mbps	30 Mbps	Fiber
Forks Community Hospital	530 Bogachiel Way, Forks	OlyPen/PUD	100 Mbps	100 Mbps	Fiber
Forks District Court (II)	502 E Division Street, Forks	Wave	100 Mbps	100 Mbps	Provisioned Ethernet Link
Forks HHS	140 C ST, Forks		1.2 Mbps	1.2 Mbps	T1
Forks Road Shop	51 Bedrock Road, Beaver	CenturyLink	N/A	N/A	DSL
Greywolf Elementary School	171 Carlsborg Rd, Sequim	CenturyLink	2 Gbps	2 Gbps	Fiber
Guy Cole Event Center	202 N Blake Ave, Sequim	Olypen	100 Mbps	100 Mbps	Fiber
Helen Haller Elementary	350 West Fir St, Sequim	CenturyLink	2 Gbps	2 Gbps	Fiber
Jamestown Family Health Clinic	808 N 5th Ave, Sequim	OlyPen/PUD	Unsure of connection speeds		Fiber
John Wayne Marina	2577 W Sequim Bay Rd, Sequim	Olypen	30 Mbps	10 Mbps	DSL
Juvenile and Family Services	1912 W 18th St, Port Angeles	Wave	1 Gbps	1 Gbps	Leased Dark Fiber
K-12 Clallam Bay School	16933 Hwy 112, Clallam Bay	CenturyLink K-20	50 Mbps	50 Mbps	Fiber
LaPush PD	1472 Ocean Dr, La Push	Unsure of connection speeds and infrastructure			

Facility Name	Facility Address	Provider	Down Speed	Up Speed	Technology
Lower Elwha PD	341 Spokwes Dr, Port Angeles	Unsure of connection speeds and infrastructure			
Neah Bay	3560 Deer St, Neah Bay	OlyPen	100 Mbps	100 Mbps	Fiber
North Olympic Healthcare Network	240 W Front St, Port Angeles	Wave	100 Mbps	100 Mbps	Fiber
Olympic Peninsula Academy	400 North 2nd Ave, Sequim	CenturyLink	2 Gbps	2 Gbps	Fiber
OMC (Olympic Medical Center)	939 Caroline Street, Port Angeles	Century Link	400 Mbps	200 Mbps	Fiber
OPNET	110 S Penn St, Port Angeles	Wave	50 Mbps	50 Mbps	Provisioned Ethernet Link
Pencom	321 E 5th St, Port Angeles	County network	Unsure of connection speeds		Fiber
Peninsula College (Forks/West End)	481 South Forks Avenue, Forks	K-20 Fiber to Main Campus	30 Mbps	30 Mbps	Fiber
Peninsula College (Main Campus)	1502 E Lauridsen Blvd, Port Angeles	CenturyLink K-20	1 Gbps	1 Gbps	Fiber
Port Angeles 3rd Street HHS	111 E 3rd St, Port Angeles	Wave	100 Mbps	100 Mbps	Provisioned Ethernet Link
Port Administration Office	338 W First St, Port Angeles	Wave	1 Gbps	1 Gbps	Fiber
Port Angeles Boat Haven	202 N Cedar St, Port Angeles	OlyPen	35 Mbps	10 Mbps	DSL
Port Airport Industrial Park	South O St, Port Angeles	Wave	1 Gbps	1 Gbps	Fiber
Port Angeles City Hall	321 E 5th St, Port Angeles	Wave	1 Gbps	1 Gbps	Fiber
Port Angeles Fire Department	102 E 5th St, Port Angeles	Unsure of connection speeds and infrastructure			
Port Angeles Main Library	2210 South Peabody Street, Port Angeles	K-20	500 Mbps	500 Mbps	Fiber
Port Angeles Road Shop	1033 W Lauridsen Blvd, Port Angeles	Wave	100 Mbps	100 Mbps	Provisioned Ethernet Link
Port Composite Manufacturing Campus	2138 West 18th St, Port Angeles	Wave	1 Gbps	1 Gbps	Fiber
Port Marine Terminal	202 N Cedar St, Port Angeles	Wave	1 Gbps	1 Gbps	Fiber
Sequim Branch Library	630 North Sequim Ave, Sequim	Wave	1 Gbps	1 Gbps	Fiber
Sequim City Hall	152 W Cedar St, Sequim	Olypen	100 Mbps	100 Mbps	Fiber
Sequim District Office	503 North Sequim Ave, Sequim	CenturyLink	1 Gbps	1 Gbps	Fiber
Sequim High School	601 North Sequim Ave, Sequim	CenturyLink	2 Gbps	2 Gbps	Fiber
Sequim James Center for the Performing Arts	202 N Blake Ave, Sequim	Olypen	1.5 Mbps	1.5 Mbps	DSL
Sequim Middle School	301 West Hendrickson, Sequim	CenturyLink	2 Gbps	2 Gbps	Fiber
Sequim Middle School	301 W Hendrickson Rd, Sequim	Olypen	25 Mbps	25 Mbps	Fiber
Port Williams Pump House	381 Port Williams Rd, Sequim	Olypen	3 Mbps	1 Mbps	DSL

Facility Name	Facility Address	Provider	Down Speed	Up Speed	Technology
Sequim Re-use Center	202 N Blake Ave, Sequim	Olypen	1.5 Mbps	1.5 Mbps	DSL
Sequim Road Shop	1453 W Washington, Sequim	Olypen/Wave	N/A	N/A	Cable
Sequim Transit Center	190 W Cedar St, Sequim	Olypen	100 Mbps	100 Mbps	Fiber
Sequim Wastewater Reclamation Facility	247 Schmuck Rd, Sequim	Nikola	20 Mbps	~25% of download	Wireless
Sequim Well	124 W Silberhorn Rd, Sequim	Olypen	1.5 Mbps	1.5 Mbps	DSL
Sequim Well	551 Reservoir Rd, Sequim	Olypen	1.5 Mbps	1.5 Mbps	DSL
Sequim Well	702 Port Williams Rd, Sequim	Olypen	5 Mbps	1 Mbps	DSL
William R. Fairchild International Airport	1402 Airport Rd, Port Angeles	Wave	50 Mbps	50 Mbps	Fiber

Below are map representations of the Anchor Institutions:

Figure: 16: Anchor Institutions in the Entire County

Figure 17: Anchor Institutions in Eastern Clallam County

Figure 18: Anchor Institutions in Central Clallam County

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Figure 19: Anchor Institutions in Western Clallam County

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Broadband/Internet/No Service Areas

A determination was made early in the Project to not only identify Broadband providers and each of their infrastructures and footprints, but we would also collect non-Broadband Internet provision information as well. In the following maps, we show where Broadband is available and where it is not available but we also show where Non-Broadband Internet is available. In the areas where we show no Broadband availability, the speeds tended to vary considerably to as low as < 1Mbps all the way up to just barely broadband. Because the broadband speeds were often identified through a connection such as the K-20 network at a school or via a cellular network, we used the vast majority of sub-Broadband information and speed tests to categorize the area. The map below shows the identified availability of non-Broadband Internet service:

Figure 20: Internet Available but not Broadband

Broadband Speeds

Determinations were made in areas where broadband is available as to the maximum speeds offered by providers. The analysis can be difficult as speed test findings and even residents' understanding of broadband speeds tend to blur the actual realities in place. Residents' may be subscribing to speeds less that the maximum provided in an area and therefore their speed tests will show lower service levels. Furthermore, because speed tests and residents' perceptions are often based on what their device is getting for service, internal networking (in-home wiring and Wi-Fi) as well as the number of devices using the in-house network can skew the results lower that what is actually provided to the residence.

We determined that although CenturyLink can, and does, provide Broadband to some locations, it is far more common that DSL in the County is sub-Broadband. Wave serves customers with speeds up to 940/10 Mbps. Most customers do not subscribe to this level of service and some still get sub-Broadband speeds that meet their current needs for speed and cost.

Wireless services are also somewhat difficult to quantify. Although the providers claim to offer Broadband speeds, distance from the tower/antenna and obstacles in the path between the home

and tower will drop the available speeds to the point of no service being available. This is seen, as an example, when neighbors have drastically different speeds available because of obstacles in the path of one home but less problematic for the other home.

The Gap map below illustrates the limited availability of uniform Broadband speeds throughout the County.

Gaps Demonstrated

Based on the above maps that show us where Broadband is, we then created a map layer to show where Broadband is not available. This map includes 9,960 residential units throughout the County and includes most addresses that are outside of the Port Angeles and Sequim areas. There are locations along the main highways and in and around Forks that can access Broadband speeds, but these appear intermittent, so we cannot label any of these areas as uniformly Broadband Available. It should be noted that many of these addresses can get some level of Internet service, but as explained elsewhere in this Report, the speeds achieved are from just above dial-up (56 Kbps or 0.056 Mbps) up to near Broadband speeds.

The areas of the gaps in broadband availability are shown in the map below
in the non-green area.
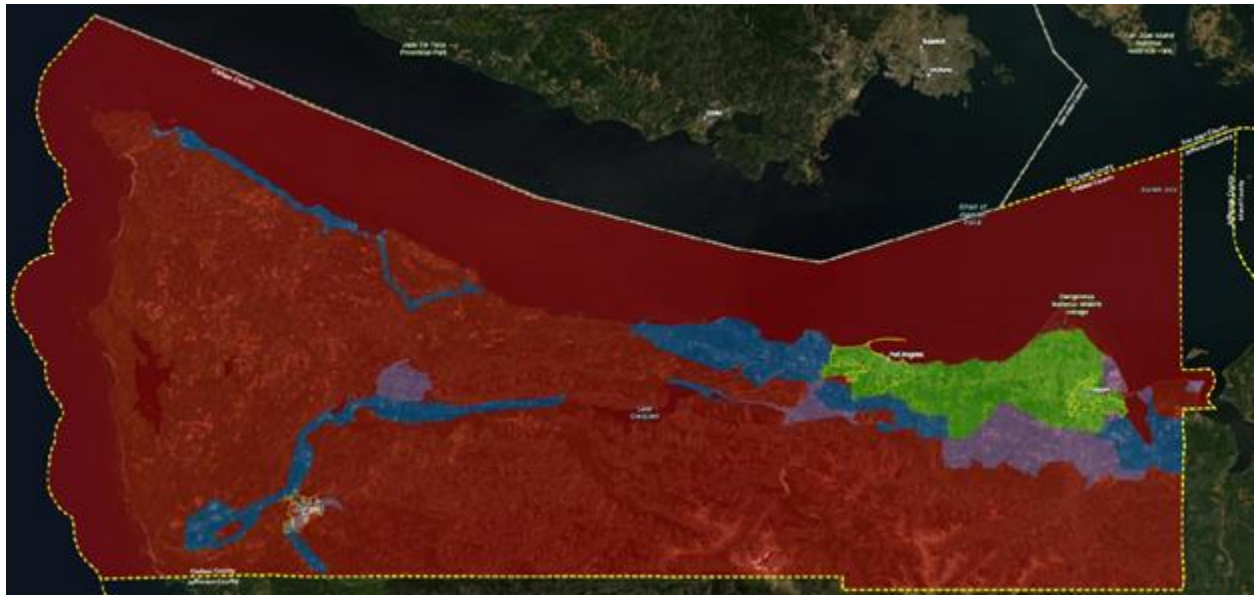
Figure 21: Gap Map – The red areas represent no Internet availability. However, Broadband is only consistently available in the green area.

The green areas of the County have Broadband uniformly available today at minimum speeds of 25 Mbps in the forward direction and 3 Mbps in the return direction. The blue areas of the map show where Internet is available but not at or above Broadband speeds. The purple areas (under Sequim, and in Forks, for example) are areas where some Broadband exists but in a patchy manner

where more addresses with non-Broadband speeds are intermixed with a small number of addresses with Broadband availability.

The large areas shown in red are areas where no Internet exists or where the area has minimal Internet but primarily has no-Internet available in the area.

All of this, equating to everywhere except the green areas in and around Sequim and Port Angeles, represent GAPS in Broadband service today.

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Section 5 – Applicable and Existing Broadband Models

SECTION 5 – APPLICABLE AND EXISTING BROADBAND MODELS

The initial assessment of existing Broadband providers, infrastructure and technologies, along with the needs demonstrated and the gaps in Broadband service identified, pointed to three (3) possible models for Broadband development and deployment that could provide feasible scenarios for future expansion and enhancement. These are:

1. **Public Broadband Development Model** – Focused on the use of publicly-owned and operated infrastructure and services.

2. **Private Broadband Deployment Model** - Focused on expansion and enhancement of commercially-owned and operated networks and services.

3. **Public-Private Broadband Deployment Model** - Can take various forms, but is often exemplified by private company use of public middle mile infrastructure.[16]

More specifically:

Public Broadband Development Model

The hallmark of a true Public Broadband Development Model is the provision of Broadband service end-to-end by a public entity. These most often are add-ons to existing public utility services. Public power entities, for example, were some of the earliest publicly-owned utilities to enter into the provision of Broadband (and before that, cable television) services. One of the best known of these is the Glasgow Kentucky Electric Plant Board which began providing cable television services more than two decades ago and more recently Broadband services, as a municipally-owned power and Broadband utility system.[17]

Later well-known entrances in the provision of such services include Lafayette Louisiana's LUS fiber, which now provides Gigabit Broadband speeds to homes and businesses throughout most of Lafayette Parish. LUS has recently received a US Department of Commerce Economic and Development Administration (EDA) Grant of $3.1 Million to develop and build Broadband infrastructure in more of its rural southwest territory, including in two neighboring Parishes.[18]

In Washington, one of the higher-profile public-utility owned networks is the City of Anacortes Fiber Internet system which is based, not on a public power utility, but on a municipal water utility.

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[16] "Middle mile" infrastructure is often defined as high capacity short or long-haul backbone infrastructure, as opposed to "last mile" infrastructure which is typically the specific laterals or distribution infrastructure to individual neighborhoods or homes. Middle mile is currently often comprised of multiple strands of fiber optic cable and technologies like wavelength division multiplexing which allow multiple services or providers to ride the same "Broadband Highway". In the past, middle mile was often high-capacity microwave communications, and even today, fixed wireless systems sometimes have wireless middle mile or backhaul.

[17] See Bibliography, #8.

[18] See Bibliography, #2.

Also, in Washington, other public utilities, specifically large county-wide entities such as Public Utility Districts, are expressly prohibited in most cases from providing end-to-end Broadband services, and must instead follow the public-private partnership model. Many of the PUDs in the state have been pursuing the public-private Broadband development Model for Broadband expansion, as further described below.

There is currently no public, end-to-end, broadband retail model for residents and businesses in Clallam County. This could change if the state law changes. There is currently legislation in Washington to enable this to occur. If it passes, it is a model that could be pursued for Broadband expansion and enhancement in the County.

Private Broadband Deployment Model

The private broadband deployment model incorporates multiple different types of wireline and wireless deployments and together, especially in the more densely populated metropolitan areas within the State (such as in and around Seattle), comprise the largest group of providers of Broadband services in Washington. These commercial providers vary widely in size and technology platform. The largest providers in the State include CenturyLink (Lumen), which provides everything from fiber-to-the-premises connectivity to various types of digital subscriber line services throughout its footprint in Washington State.

Frontier (now Ziply, where it also provides cable services) is similar in its provision of both fiber-based and copper-based services.

Cable operators such as Wave, Charter and Comcast (and Ziply as indicated above) provide cable modem-based Broadband services, ranging from basic Broadband all the way up to Gigabit services, as well as through their commercial business provider arms, fiber-to-the-premises business services.

Verizon, AT&T and T-Mobile (now including Sprint) provide primarily 4G services throughout the state that can, depending on contention, meet Broadband speeds. The increasing deployment of 5G will enable them to compete more effectively with wireline networks. Their biggest advantage, though, will continue to be mobile and portable Broadband access to the Internet.

There are also numerous types of fixed wireless systems with multiple types of licensed and unlicensed deployment, including everything from low frequency citizen band radio service (CBRS) deployments to TV Whitespace and millimeter wave technologies.

Further regarding wireless, there are both traditional geostationary satellite Broadband providers like DirecTV, Dish and Wild Blue and new providers such as Starlink using low earth orbital satellite (LEOS) technology. Geostationary satellite providers typically do not achieve Broadband speeds, while Starlink has demonstrated that it can, at least in Beta tests.

All of these categories of commercial Broadband providers are currently present in Clallam County and, as detailed below, there are private models that can be pursued for Broadband expansion and enhancement in the County.

Additionally, there are and will continue to be Federal funds to support private, commercial Broadband provider expansion in rural areas. The most recent of these are the rural digital opportunity funds (RDOF) reverse auction funds awarded by the FCC in late 2020. Both CenturyLink and Starlink received funds specifically targeted at underserved areas in Clallam County that, if the promised speeds and coverage are delivered by CenturyLink and Starlink, could help bring Broadband to those that currently don't have it available. This is explained in greater detail in the next section of the report.

Public-Private Broadband Deployment Model

The public-private model is a cooperative effort between a public-owned entity and a private commercial entity to develop and deploy Broadband service. Most often, this is a public entity providing middle mile infrastructure that is then used by the private entity to connect laterals and service drops to residential and business customers. The private entity also typically, in the case of fiber, "lights up" the Broadband service that is provided.

Around the country and in Washington state, this is a model that is pursued because there is efficiency in sharing expertise, resources, and assets and the model mitigates or shares the investment risk between the partners. One of the best nationally known public-private models has been operating for nearly two decades outside Salt Lake City and is an interlocal agency of 11 Utah communities called UTOPIA (aka, the Utah Open Infrastructure Agency). UTOPIA is a publicly owned fiber optic network that has grown over time, and has been subject to fits and starts, but currently provides fiber to the home services to 15 cities covering 130,000 residents and businesses. It offers speeds up to 10 Gigabits per second (Gbps) to residents and 100 Gbps to businesses over its fiber optic backbone network. UTOPIA does not provide these services retail. Instead, it works with 14 different broadband Internet Service Providers (ISPs) to provide these services to individual customers.[19]

It has been stipulated by some analysts as the largest, publicly-owned open access network in the country. UTOPIA has enough assets now to secure private capital funding and recently received $52.5 Million in funding for a total of $113 Million in new funding since November of 2019. It, by most accounts, is a public-private partnership success story.[20]

In Washington state, one of the most often cited is a public-private network that is operated by Grant County's PUD in central Washington. It has been providing an open access, fiber optic network since 2000 and now in conjunction with multiple private ISPs delivers fiber-to-the-home services to approximately 75% of the County. It has a completion goal of 2023 to expand the network into all currently unserved areas, but it is not without substantial cost for a County that is 2800 square miles. Estimates are the Grant County PUD has already invested $182 Million in the

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[19] See Bibliography, #11.

[20] Ibid

last 20 years and would need to invest an additional $70.2 Million to complete FTTP expansion throughout the County. That would equate to over 3,000 miles of fiber optic cable.[21]

Middle mile implementation, especially by public entities, is seen by many as the key to developing not only the most efficient and effective public-private partnerships, but also the most cost-effective ultimate deployment of services, in rural areas. This was amplified just recently in a Benton Institute for Broadband and Society whitepaper.[22]

The Clallam County PUD is already active in participating in developing public-private partnerships, and as discussed below, CBG believes that increasing these efforts will contribute substantially to Broadband expansion and enhancement in the County. Additionally, there are already funding sources to help support the development of middle mile. We also recommend pursuit at the state level of additional funding opportunities (similar to the Virginia Telecommunications Initiative) that would further advance and increase deployment if such funds were made available to the Clallam County PUD, the County's local governments and its private Broadband providers.

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[21] See Bibliography, #9.

[22] See Bibliography, #1.

Section 6 – Recommended Scenarios for Broadband Expansion

SECTION 6 – RECOMMENDED SCENARIOS FOR BROADBAND EXPANSION

Development of a Clallam County Broadband Authority

We believe that the most effective way for the Team to move forward with feasible Broadband expansion and enhancement scenarios in Clallam County for all of its diverse constituencies, is to develop a Broadband Authority. This Broadband Authority (Authority) would build upon the current Team and its work to-date and provide advantages over prior efforts including, but not limited to:

- The authority would be able to leverage the existing experience and expertise of all of its member organizations.

- It would be able to, based on the linkages that have already been established, help foster cooperation and collaboration among the various interested and affected parties in the County.

- It would serve as a clearinghouse, able to quickly identify and prioritize all available opportunities for broadband expansion and enhancement.

- It would help aggregate demand, consolidate synergistic efforts and help members go beyond "siloed" broadband expansion.

There are many good examples of authorities made up of local communities, countywide organizations, regional entities, and others to help leverage assets and resources in order to bring broadband to locations where it was previously thought that it wasn't feasible. One example is UTOPIA, as described above, which is a long-standing example and an effective public-private partnership bringing fiber-to-the-premises connectivity in locations that in other similar communities in Utah and around the country would not be feasible without a UTOPIA-like organization.

Another example is the Dakota Broadband Board (DBB) in Dakota County, Minnesota. It is a regional partnership between Dakota County, the County's Community Development Agency and 10 incorporated Cities which manages over 197 miles of a fiber optic network that traverses throughout the County. The DBB is governed by a Board that consists of one elected official from each member entity. It has a Technical Advisory Committee and an Executive Committee that oversee its operations and development of the network. At this time, it has one employee, an Executive Director.[23]

Another example which connects communities and entities in two counties is the Eastern Shore Virginia Broadband Authority (ESVBA). This Authority began in 2007 with startup funding from Accomack and Northampton counties on the Eastern Shore of Virginia, which have the Atlantic Ocean to the east, Chesapeake Bay to the west, and Maryland jurisdictions to the north, to create an independent, not for profit, Public Authority to develop high-capacity broadband to what they termed as their Virginia "island". They also received a startup grant from the Department of

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[23] See Dakota Broadband Board website, www.dbbmn.gov

Commerce's Economic Development Administration (EDA) and investment from the federal government through NASA which maintains a space launch facility in Accomack County. Over the past 13 years they have deployed approximately 320 miles of fiber and provide broadband to 350 schools, government facilities and businesses, as well as residential fiber-to-the-home Broadband service. They're an open access network that works with a number of ISPs.[24]

Proposed Membership of a Clallam County Broadband Authority

The membership of existing Broadband authorities around the country varies, but typically has as part of their governance structure (in most cases a Board), one representative from each contributing member. Our recommendation for development of a Clallam County Broadband Authority (CCBA) is to begin with all the existing Clallam Community Broadband Team members and add several anchor institution representatives not currently part of the team, but who have been involved with some of the Team's efforts including the Community Broadband Meetings. Specifically, we recommend one representative from each of the following entities:

- Clallam County
- Port of Port Angeles
- Clallam Public Utility District
- North Olympic Peninsula Resource Conservation & Development Council
- Forks
- Port Angeles
- Sequim
- Clallam County Economic Development Council
- North Olympic Library System
- K-12 School District representative
  - Potentially the Port Angeles School District (which has been involved since early in the project)
- Business Community representative
  - Potentially a rotating member from the three Chambers of Commerce and the Clallam County Economic Development Council
- A Hospital/Medical representative
  - Olympic Medical Center is the largest provider of medical services in the County, but despite outreach by the team, has not participated in the project to date. Either it, the North Olympic Healthcare Network (NOHN), Forks Community Hospital or another medical provider in the County would be highly beneficial as a representative and part of the Authority.
- Tribal Nations

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[24] See Bibliography, #3.

      o Tribal nations should also be invited to participate and could have a representative on the Board to help leverage joint opportunities (many current Broadband funding opportunities, for example, are tribal nations-specific, but there may be more potential joint opportunities going forward). The Jamestown S'Klallam tribe, for example, currently operates Jamestown Networks and would provide good synergy.

- Broadband Service Providers
  - o Broadband Service Providers should be actively involved in working with the Board, but as a not-for-profit, the Board may wish to have the service providers serve in either an advisory capacity or at "second table" to vet proposals by the Board or to participate in Broadband concept development. For example, some Broadband authorities which work with multiple providers will set up a Providers' Council, enabling them to work on joint initiatives, or not if there are conflicting competitive imperatives.

Often the representation on the Authority's Board is made up of elected officials or Chief Administrators that can directly represent their organizations, whereas technical staff members of each organization form a technical subcommittee to work on specific Broadband expansion and enhancement concepts. However, this is not always the case and each participant can be free to choose whomever they want to best represent their interests.

Regardless of how the Board is developed, there should always be an Executive Committee authorized by the Board to make quick and overarching decisions when time sensitive situations arise or to bring recommendations to the full Board for discussion and approval. Executive Committees typically have an odd number of members, so that when a vote is required, no ties will occur. Based on the necessary County-wide impact of the Authority, a potential five-member Executive Committee could be comprised of representatives from the County, NODC, the Port, PUD, and one of the two educational representatives who would rotate and would represent all educational interests.

Formalizing the Authority

The two most likely ways under Washington State Law of developing and formalizing the authority would either be through an interlocal agreement under Chapter 39.34 RCW or through creation of a Public Development Authority under Chapter 35.21 RCW. The Public Development Authority (PDA) would appear to have the greatest capability of leveraging the individual capabilities of each entity for the common purpose of expanding and enhancing broadband for the benefit of all in the County. Typically, a PDA, as a government corporation, may be rooted in its largest member, such as Clallam County government. Each of the intended Authority members would need its legal arm to review the potential benefits, before structuring the agreement and forming the Authority.

Business Model

Nearly all of the Broadband Authorities start with one staff member often titled as the Executive Director, General Manager, Project Manager, Manager, Coordinator or another title that best

defines the initial staff person's responsibilities. Based on the needs assessed during the Feasibility Study, this initial staff person should have the following qualifications:

- Federal, State and non-profit grant knowledge and grant writing expertise (especially in the broadband arena):

- Technical and technology expertise (especially related to Broadband Infrastructure and Services)

- Demonstrated management skills

- Experience leading large groups with diverse interests, and

- Advocacy experience with local, State and/or Federal Government

Initial Activities of the Authority Manager

The initial activities of the Authority Manager would be numerous, but would include:

- Working with the Board in coordinating with its members to maintain a focus on meeting the State's goals for Clallam County.

- Ensuring that activities are put in motion to ultimately meet each member's constituencies' needs.

- Prioritizing individual member's needs (for example, where sub-broadband connectivity continues to create the greatest challenge to adapting to the current COVID-19 pandemic and then post-pandemic environment).

- Prioritizing broadband expansion and enhancement projects, based on the availability of funding to adequately support those projects.

Authority Budget and Financial Commitment

The initial budget for the Authority is often a mixture of both monetary start-up funding and in-kind services related to the installation of the Manager and the support that person will need to effectively carry out the requirements of the Authority. This primarily includes:

- Salary and benefits

- Office and related expenses, and

- Support Services for the authority, including any necessary legal, accounting, consulting and other services.

A sample five-year budget is included in Exhibit J equating to $120,000.

Funding for the startup budget usually comes from contributions from each of the members, as well as equivalent in-kind services. This is typically for the first two years and then during the course of the two years, additional funding sources are identified and evaluated (including grants, loans and potential revenues from private partnerships with the Authority and/or its members). The contributions for the startup of the organization can be an equal amount (or again, equivalent in-kind services such as office space and clerical support, for example) from each member, or can

be weighted either based on the budgetary size of the organization, or in the case of those for example that only have localities as members, population size. At the outset, based on the needs assessed, which point to identified needs for the constituencies represented by all the initial proposed Authority members, we recommend that a weighted funding mechanism, based on organization budget size in proportion to all combined, be used.

Potential for a Regional Authority

Where synergies exist, there is the potential to expand the CCBA into a regional authority, or at a minimum collaborate on projects occurring on the Olympic Peninsula. The Jefferson County PUD currently has an active Broadband deployment project, which is working each year to expand its Broadband footprint with middle mile projects that assist Broadband service deployment by private ISPs. The Grays Harbor PUD has been developing fiber for over 20 years and provides similar middle mile services for a number of local ISPs.[25] The Mason PUD continues to develop public-private partnerships and recently received a USDA Reconnect grant for deployment of high-speed Broadband to 250 households and businesses in the Grapeview area.[26] Since Ports received the authority to also pursue development of Broadband infrastructure, some Ports have banded together in regional and multi-regional cooperatives to pursue common goals of solving Broadband issues within their areas. For example, the Ports of Kalama, Ridgefield, Bellingham, Skagit County, Pasco and Whitman County banded together to form a publicly owned LLC, Petrichor Broadband, in the past year.[27]

As the CCBA is developed, it will be important to look at synergies on a regional basis and determine where focusing on expanding Broadband in the region will benefit the constituencies in Clallam County as well.

Broadband Deployment Scenarios

Based on the needs identified during both the initial assessment and in-depth needs assessment phases of the project, the identification of Broadband Providers, coverage areas and Gaps and the existing Broadband deployment and development in the County, and following the models discussed above, CBG has identified several potential, feasible ways to move forward with Broadband expansion and enhancement over the next three, five and seven years to meet the State's goals for the provision of broadband infrastructure and services to Clallam County residents and businesses. These are:

Expansion of Middle Mile Fiber Infrastructure

We believe an expansion of the PUD's existing fiber optic infrastructure into a middle mile network serving across the County will be highly beneficial as a baseline for: enhancement of existing sub-broadband services (also including for "no service" or dial-up locations) to minimum

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[25] See Bibliography, #10.
[26] See Bibliography, #4.
[27] See Bibliography, #12.

Broadband speeds between now and 2024; and enhancement of existing minimum Broadband services into 150 Mbps symmetrical services in the future.

The first phase of this deployment should be consistent with what the PUD proposed in the most recent round of Public Works Board grant funding: an extension of middle mile from the current end point just outside of Port Angeles to where its existing fiber is located north of Forks and then all the way to La Push.

This would meet both goals for enhancement of services for those currently with sub-broadband DSL along that route, as well as provide opportunities for fiber-to-the-premises and high-capacity fixed wireless providers to meet the States' 150 Mbps goals in the future, by extending from new fiber middle mile just outside of Port Angeles in the central part of the County, and by providing enhanced service in Forks and the surrounding area, and then down to La Push. This also meets PUD objectives of enhancing its monitoring, control, and smart grid information systems related to electric power distribution where it has facilities along that route.

While the initial application was unsuccessful, there will be future funds available from the State as well as from the federal government targeted at expansion of middle mile infrastructure that could be leveraged to help support the cost of development. We understand that the Clallam PUD, unlike others which have used their taxing authority, development of local utility districts (LUDs) and pursuit of a variety of loan and grant opportunities, has a current policy of ensuring that projects are fully funded by other sources rather than investing existing PUD funds or using other portions of their authority to generate revenue to support broadband deployment efforts. The CCBA, once established, can work to identify funding opportunities that would meet the PUD's existing policy or work with the PUD to identify infrastructure investment opportunities that would be within its tolerance for future risk.

Another possibility, if the State legislature as it is considering now, determines that it will allow much broader authority for PUDs to offer retail Broadband services (not just wholesale where the last mile services are provided by private partners), there would be additional revenue-generating opportunities that could mitigate any investment risk.

Beyond the middle mile infrastructure established from outside of Port Angeles to La Push, there are other portions of middle mile infrastructure development that the PUD should consider. These include:

- Forks to Neah Bay
- Forks to Lake Crescent (west end of the lake)
- Port Angeles to Lake Crescent (eastern end of the lake)

Shown on the map below, the PUD's existing fiber appears as purple lines on the map with the majority being on the eastern end of the County, ending at Port Angeles. The expanded middle mile infrastructure, including the first phase from Port Angeles to La Push, is shown in red on the map.

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Figure 22: New proposed expansion from the PUD's existing fiber optic network as middle mile fiber optic infrastructure. The proposed expansion is shown in red.

We have created the mileage and cost estimates below by utilizing existing PUD poles and poles owned by BPA which were included in the PUD's Grant application. We estimate that 45% of the construction would be underground due to areas with no access to poles and where the fiber needs to dip under roads due to clearance issues.

This would expand the amount of public middle mile within Clallam County to both match and go beyond the current commercial middle mile in the County. We understand that CenturyLink has received RDOF funding (as described in greater detail below) to expand its middle mile and last mile infrastructure to provide fiber-based and xDSL services at Gigabit download speeds in some of these areas in the western part of the County. It is however, unclear exactly how much fiber optic infrastructure would be deployed and whether CenturyLink would be able to match the ability to provide cost-effective fiber-to-the-premises services for all the households that could be served from the public middle mile infrastructure we propose.

Based on the timings required by the FCC as part of the award of the RDOF funds and on the availability of funds to support the PUD effort, it is important to consider that the PUD's public middle mile would conceivably not be the only middle mile infrastructure that could be used.

However, it has been shown in many cases[28] that public middle mile will not only likely be more cost-effective to be used by multiple different providers than commercial middle mile, but that it will also serve to drive down the cost for consumers of the services provided by the commercial middle mile provider, in this case CenturyLink. Accordingly, from that perspective, there is a distinct public policy benefit, which helps create the most likely scenario for meeting the State's 2028 goals.

Public Middle Mile Expansion Business Model

Unless the PUD decided to pursue the provision of retail services, if the current legislation is successful, the model that would be followed would be a public-private model where a variety of private ISPs, including both wireline and wireless, would have access to the PUD's middle mile infrastructure. From an operational perspective, if the infrastructure is slated to be built in phases over the next 3 years (so up through the third year, private providers would be able to provision 150 Mbps symmetrical service) it is likely that the PUD would have to add at least one technical staff member to assist existing staff members in focusing on the fiber deployment for Broadband purposes, as well as for power mentoring and control purposes. That operational cost could be projected, based on the following:

A Fiber Optic Lineman would be needed to react to any failures that might occur on the fiber optic infrastructure. This person would be the contact/point person for all emergencies that impact the network. This Technician would need to be trained in fiber optics and be able to understand how impediments to the system are created and overcome. The Technician would need to be able to diagnose problems with equipment such as power meters and OTDRs. In addition, this technician would perform or oversee splicing on the network during activation of new fiber optic strands as well as during emergency restoration. We use the following estimates to quantify the financial cost of this Technician:

Table 7: Estimated cost of a single outfitted technician.

Technician's salary loaded to reflect taxes, benefits and training:	$95,000 Annually
Bucket truck, tools, power meter, OTDR, laptop with mapping & Fiber management programs, cell phone, etc.:	$38,500 Annually
Total Annual Cost:	$133,500 Total

In our construction formulas below, we utilize $80,000 per mile when underground construction is required and $50,000 per mile where aerial construction is possible. We then blend these rates based on anticipated percentages of underground and aerial construction. These construction costs are higher than average costs of construction in Clallam County due to a high number of river and creek crossings in the western half of the County. These crossings require additional permitting,

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[28] See Bibliography, #1

placement of environmental protections during construction and additional inspections of construction areas by State and Federal agencies. In addition, there are known areas that would require placement of new poles and significant make-ready work prior to attaching fiber optic infrastructure to poles. These costs are based on conversations with PUD staff and costs of construction in similar builds.

Regarding the construction needed, based on average costs per mile, the entire cost would equate to the following:

Table 8: Expansion of fiber optic infrastructure (middle mile) to add to the PUD's existing network.

Expansion of Middle Mile Fiber Optic Infrastructure			
		Miles	Cost
New Underground Fiber	45%	69.75	$5,580,000
New Aerial Fiber	55%	85.25	$4,262,500
New Fiber Optic Cable Estimate		155	
Total Estimated Cost			**$9,842,500**

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Table 9: Potential use of grant funds and financing of infrastructure costs.

Expansion of the PUD's Existing Network to add Middle Mile Fiber Optic Infrastructure

New Fiber Optic Cable Estimate	155
Total Estimated Infrastructure Cost	**$9,842,500**
Estimated Total Capital Expenditure	$9,842,500

Annualized over 5 years @ 4% interest	Per Year	$2,167,956
Requires an average of 7,227 subscribers at $300 per year		**($2,168,100)**
Balance sheet, end of year		**$144**
Average per year over five years:		
*50% Grant		($1,083,978)
After 50% Grant, Requires 3,614 subscribers at $300 per year		($1,084,200)
Balance sheet, end of year		**$222**

Annualized over 7 years @ 4% interest	Per Year	$1,609,068
Requires 5,364 subscribers at $300 per year		$1,609,200
Balance sheet, end of year		**$132**
Average per year over seven years:		
*50% Grant		($804,534)
After 50% Grant, Requires 2,682 subscribers at $300 per year		($804,600)
Balance sheet, end of year		**$66**

* Many grants require less than 50% match. Some require as low as 10% Grantee funds, which would substantially decrease the PUD contribution and payback period.

In the public-private model, assuming the same situation as now in that either the provider or the customer pays the last mile lateral cost and the ISP takes the risk related to service provision, then the payback period (return on investment) for the PUD would depend upon the amount of grant funding obtained.

If for example, it was a matching grant at a 50% match, and the PUD was providing wholesale services to ISPs and looking at the worst-case scenario of public funds providing the match, then average annual wholesale revenues over the five years of $1,083,978 would need to be achieved in order to have the funds paid back within a five-year period. If, however, the repayment was based on a seven-year term, $804,534 would need to be achieved to pay off the financed portion of the construction.

The maps and cost projections are further detailed in Exhibit K.

All in all, based on the life expectancy of the fiber once placed and the projected increasing amount of services that would flow over the fiber over time, creating additional wholesale revenue for the PUD, we anticipate that the fiber placed would be a revenue generator for decades to come.

Commercial Provider Broadband Service and Infrastructure Expansion

There are multiple possibilities for commercial providers currently in the County to expand their services and infrastructure, including the deployment of new technologies.

Wave Broadband

For example, there are several expansion possibilities for Wave Broadband. Wave Broadband (Wave) currently provides Cable Television (and thus cable modem-based broadband services, as well as fiber to the premise broadband services for businesses), within and around the Sequim City limits and Urban Growth Area as well as within the Port Angeles City limits and Urban Growth Area and beyond into Clallam County. Just beyond Wave's current service footprint, though, are a variety of pockets of residents that we believe can be served cost effectively by Wave, taking into account deployment of new technologies and the potential application of State and Federal funding. Specifically:

- **Within Port Angeles and its Urban Growth Area –** We understand, based on Port Angeles' current franchise with Wave, that the company has the requirement to make service available to all residences within Port Angeles. However, evidence suggests that this may not have universally occurred. Because of Port Angeles' requirements in a separate agreement with Wave to provide fiber connectivity to a number of its facilities within and beyond the City limits, there is Wave fiber available that could be leveraged to provide service to these additional homes. Regardless, there is a current buildout franchise requirement that should be reviewed with Wave to ensure that service is made available to all required homes.

  Wave, though, in all the scenarios we describe herein, has the opportunity to "leapfrog" its current technology. While, its cable modem-based services meet the State's minimum broadband requirements, it could, as other cable operators are doing, utilize more advanced Cable/Broadband deployment technology for system expansion, such as a Fiber PON (Passive Optical Network). Essentially, Wave by providing the right amounts of infrastructure between its headend and fiber nodes and then extending fiber from those nodes (instead of coaxial cable) to the homes, could provide both an expansion and upgrade of its system, while connecting homes to infrastructure that will enable services well beyond the State's 2028 goal of 150 Mbps symmetrical all the way to 1 Gbps symmetrical and beyond. As shown in the Construction Cost projection discussion below, the cost differential to deploy Fiber PON infrastructure versus Hybrid Fiber Coaxial (HFC) Cable infrastructure is de minimus. It therefore makes sense for any expansion of the Wave system to be Fiber PON-based, thus meeting two goals at once.

  For homes in the County, beyond Port Angeles and Sequim, there is currently no density requirement in the County's franchise with Wave that would require Wave to expand its system beyond its current footprint. However, the County is currently in the franchise

renewal window with Wave (its current franchise is expiring in May of 2022) and system buildout is a point of negotiation. Also, from the Needs Assessment, it's clear that it is a critical concern for County residents. Moreover, the Federal Communications Commission has noted that system buildout for all broadband systems, especially in rural areas, is a critical national imperative. Finally, the effects of the pandemic on those with sub-broadband services and the associated impacts on telelearning, telework, and telehealth are demonstrably problematic, and thus a public policy imperative is to seek expansion of broadband service where it is not currently available.

Therefore, we believe that system buildout, while ostensibly for Cable Television it clearly brings broadband service as well, needs to be a critical point of negotiations between Wave and the County. We believe that with the Federal funding that will continue to be targeted at rural broadband expansion (beyond the current RDOF funds awarded and the phase two RDOF funds anticipated) as well as State funds that may be available, based on funds that filter down from the Federal level, that Wave's effort in this regard could also potentially be subsidized by grant funding. In fact, we would recommend that the Team and subsequently the Authority pursue development at the State level of funding targeted at public-private partnerships between local communities and Cable/Broadband providers.

For example, in Virginia, the state has long had the Virginia Telecommunications Initiative (VATI) which provides grant funding from the State to match funding from localities and Cable/Broadband providers to serve rural areas. The Cable/Broadband provider typically provides the funding that it normally would for a build that would meet its density threshold for its existing return of investment (normally a payback period of 3-4 years after the build is completed). The State then puts in the lion's share of the funding, with the locality providing the remainder. Due to the pandemic, Virginia this year is vastly increasing its VATI funding to over $50 million.[29] This type of funding, if available from Washington State, allocated to projects identified by Wave, the County, and the CCBA would go a tremendously long way to building a number of pockets within the County outside of Sequim and Port Angeles that could conceivably expand Wave broadband services to nearly every resident in Eastern and parts of Central Clallam County.

Working to expand Wave's system in this regard could potentially bring broadband to an additional 3,270 homes in Clallam County. It also, by leapfrogging technology, would allow Wave to expand its current system and begin to upgrade its existing system by, over time, upgrading HFC infrastructure to fiber PON infrastructure throughout its entire current footprint in and around Sequim and Port Angeles.

Business and Operational Model

The business and operational model would remain essentially the same as it currently is for Wave's existing system, perhaps adding a service technician as the system would expand substantially. The larger investment would be Capital Construction Cost for expansion, and then over time, in

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[29] See Bibliography, #7.

order to meet the State's 2028 goal, the upgrade cost of the existing Sequim, Port Angeles and County build to-date. Cost projections for the expansion, related to cost per mile and cost per home are the following:

We created a design for an area south of Sequim referred to as the Lost Mountain Road area. In this area, we determined there are approximately 323 homes that would be passed, and service made available to them, by constructing 27.3 miles of fiber optic infrastructure at a blended rate of $46,500 per mile. This accounts for an approximate split of 70% of the infrastructure being aerial and 30% being underground. The total cost of the project is estimated at $1,269,450 to serve the 323 homes or about $3,930 per home passed. This high-level design is shown graphically in Exhibit L.

We took these numbers and applied them to the areas surrounding Port Angeles and Sequim that are not currently served by Wave and that do not currently have Broadband availability. The density in these areas is a bit lower, so the numbers we estimate here are a little higher on a per home basis. The following table provides an estimate to build out the entire unserved area around Sequim and Port Angeles:

Table 10: Estimation of expansion of Wave Broadband's infrastructure in eastern Clallam County.

Expansion of Wave Fiber Optic Infrastructure

		Miles		Cost per Mile
New Underground Fiber	30%	82.5	$7,012,500	$85,000
New Aerial Fiber	70%	247.5	$7,425,000	$30,000
New Fiber Optic Cable Estimate		330		
Total Estimated Cost		**$14,437,500**		
Total Homes		3270		
Homes Per Mile of New Plant		9.91		
Estimated Cost per Home Passed		**$4,415.14**		

Return on Investment/Payback

Regarding the return on investment, Wave like many operators has in the past looked for a 3 to 4-year return on investment. Based on the cost per home of expanding into areas of the County currently unserved by Wave, this type of build would potentially exceed that payback period. There are now though, two things to consider. One is the possibility of grant funding discussed above. The other is that, with recent the acquisition of Wave's parent company Radiate Holdings by Stonepeak Infrastructure Partners, an infrastructure venture capital firm, the stated intent is to provide resources to be able to expand infrastructure. In fact, Stonepeak's anticipated payback period has been reported to be double expected typical cable system returns on investment, or a period of 6-8 years or more. Taking these factors into account, the payback period for expansion,

as well as the payback period for enhancement of its existing system appears reasonable and feasible, given Wave's current rate structure, anticipated take rates and the anticipated higher revenue per home that would come from symmetrical 1 Gbps services from a Fiber PON infrastructure.

Furthermore, the ongoing maintenance and recurring costs are significantly lower for passive networks such as FTTH or PON technologies. The needs for power in the system are much lower, troubleshooting and repairing of the system to eliminate interference is no longer a cost for the operator and drop-related problems are fewer with fiber optic drops compared to coaxial drops.

While performing this rollout of a new fully fiber optic-based infrastructure for all newly served addresses, Wave could build in a cost per home that would be substantially less than the cost to expand its system, to upgrade its current subscribers to a fully passive PON architecture. In addition, Wave, regardless will almost certainly need to perform upgrades to its the current system to continue to offer higher speeds in the forward direction and especially in the return direction, so going to a PON design would be comparable in cost to these and other types of upgrades.

CenturyLink

As discussed above, CenturyLink currently provides digital subscriber line services, both sub-broadband and broadband, throughout much of Clallam County where it also provides incumbent local exchange telephone service as the provider of last resort. CenturyLink also facilitates some Fiber to the Premises services for business and institutional applications at symmetrical speeds of 50 megabits per second up to one Gbps. CenturyLink's focus on enhancing its existing sub-broadband DSL footprint, as well as expanding services was largely unknown until its RDOF filing and award showed the following upgrade to DSL-based gigabit service levels (in the download direction) over this coverage area. Analysis shows that not all households in these census blocks would be provided this level of service, leaving many that are currently at sub-broadband levels to remain at those levels.
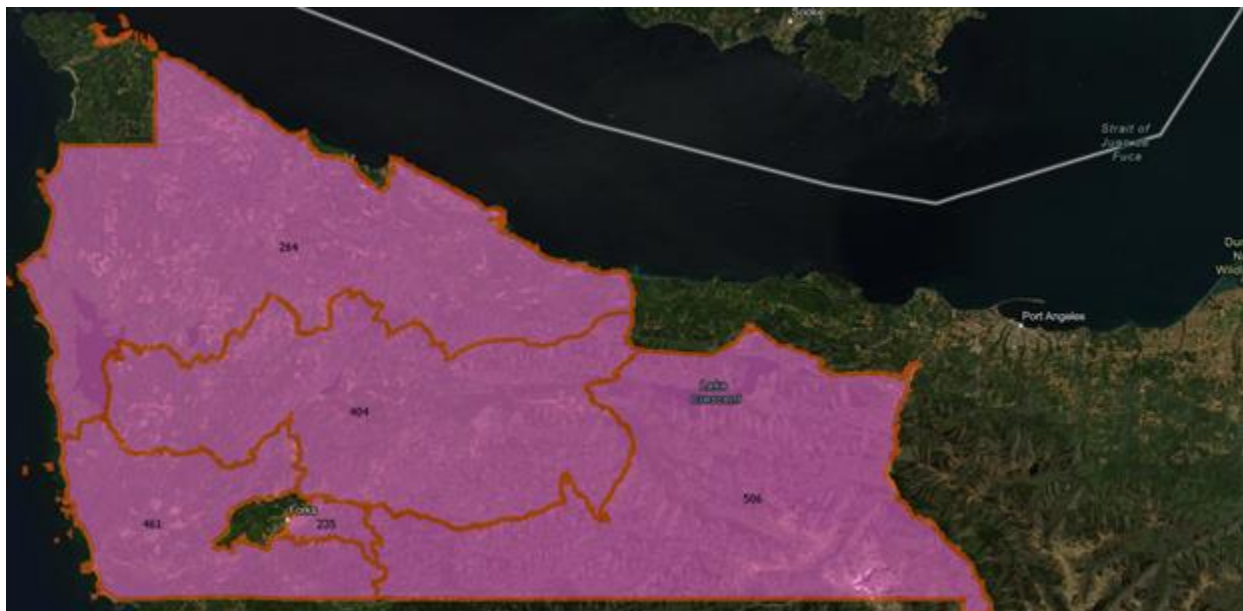
Figure 23: Areas to be served by CenturyLink with RDOF support.

The map above shows the Census Block Groups that CenturyLink received RDOF funds to build out. The Table below shows the number of housing units in each of those Census Block Groups. It must be understood that the Census, although updated with estimates between 10-year counts, does not perform estimates at the Census Block/Block Group level. It appears the FCC used estimated numbers for the Block Groups that were included in the RDOF Auction which accounts for CenturyLink building to more Units in some cases than existed in 2010.

The more interesting variance is where CenturyLink is only planning to build to less than 100% of the Housing Units counted in 2010. This is true for the first 3 out of 6 Census Block Groups in Clallam County. Without adding any new homes to the 2010 Census numbers in the County, CenturyLink's plans are to build out to at least 594 less Housing Units than exist in these Block Groups.

Table 11: CenturyLink's planned expansion of Broadband vs. number of housing units in six Census Block Groups:

Census Block Group #	Total # of Housing Units (2010 Census)	Total # of Housing Units to be Served by CenturyLink
530090004002	564	461
530090003002	713	235
530090006002	519	506
530099400001	353	414
530090002001	251	264
530090004001	382	404

CenturyLink indicated that it would be able to make these upgrades, enhancements and expansions based on the awarding of RDOF funds in the average amount $3,286 per household, impacted by the upgrade, in the Clallam County area.

There are concerns about CenturyLink's stated implementation. Although not clearly known for Clallam County, in its Federal RDOF filing it promised to build 40% of its entire footprint where the funds were rewarded across multiple States within three years and the remainder within six years.

This conceivably could meet the State's goals for specified locations in Clallam County, depending upon where and when CenturyLink builds in the County utilizing the RDOF funds. There remains a number of concerns though, based on the prior reported history of CenturyLink meeting FCC deadlines, as well as the reported problems of current CenturyLink DSL customers in Clallam County (e.g., speeds slower than anticipated, descriptions of ageing infrastructure both to the house and inside the house, and related problems indicated from the survey responses). CenturyLink indicated to the FCC that its return on investment will be met based on the awarding of these funds, and its business and operational model would be adjusted if needed to complete these builds. CenturyLink's current DSL charges, which meet its existing ROI are the following:

Table 12: Retail costs for CenturyLink's current offerings in Clallam County.

CenturyLink	DSL	10 Mbps/50 kbps	40/3 Mbps		
		$49.00	$55.00		
Resellers' Pricing for CenturyLink Services					
OlyPen	DSL (CenturyLink)	256/256 kbps	1.5 Mbps/896 kbps		
		$33.00	$46.00		
North Olympic Peninsula Data Centers	DSL (CenturyLink)	6 Mbps/500 kbps	15 Mbps/750 kbps	30/1.5 Mbps	80/10 Mbps
		$39.95	$49.95	$59.95	$69.95
	FTTP (CenturyLink)	100/100 Mbps	500/500 Mbps	1/1 Gbps	
		$79.95	$89.95	$99.95	

It is not yet clear what subscribers for gigabit xDSL services would be charged.

What is evident, in consideration of all the unknowns, is that if the CCBA and PUD pursue public middle mile builds, based on experiences all around the country, this would not only provide competing fiber to the premise technology, but competition would have a positive impact on the ultimate charges to the customer for CenturyLink's gigabit services.

Starlink

Starlink, by all accounts performs well when it performs, but some beta testers have experienced difficulties in obtaining continuous service. Like most satellite services, there will be issues with terrain and dense foliage that serve to block the signals needed for upload and download purposes. When it performs, Starlink indicates that it can provide 100 Mbps download and 20 Mbps upload speeds. This meets the State's and FCC's minimum broadband speed standards and certainly, in cases where it is available and continuous service is realized, it will be far better than substandard broadband Internet access evidenced in the County by a number of those with DSL connections, dialup and other forms of satellite service. What is unclear, is whether it will enable the user to meet the State's 2028 goals of 150/megabits symmetrical. Starlink's next promised jump is to 300 Mbps download, but with no stated improvement in upload speeds.

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Figure 24: Areas to be served by Starlink with RDOF support.

Starlink received RDOF funding to cover 13 census block groups in Clallam County similar to those shown above for CenturyLink. In all 13 census block groups awarded to Starlink, there are fewer housing units projected to be served than what exist. In all but 2 of the block groups the difference is substantial, as shown in the Table below, and equate to more than 5,000 homes out of the 8,036 included in these blocks that will not be serviceable. Then, if there is some level of growth in housing units in these block groups, the number of unserved homes could increase proportionately.

Table 13: Starlink's planned expansion of Broadband vs. number of housing units in six Census Block Groups.

Census Block Group #	Total # of Housing Units (2010 Census)	Total # of Housing Units to be Served by Starlink
530090003003	477	55
530090003004	333	121
530090006001	556	487
530090006002	519	506
530090006003	880	700
530090007002	992	4
530090015001	509	164
530090015002	420	45
530090018001	925	183
530090018002	348	160
530090023001	916	461
530090023002	955	117
530099400002	206	202
Total	8,036	3,003

Additionally, it is yet to be seen what effect a mass roll out of Starlink services would have on any individual subscriber. Also, at this point, Starlink's cost is among the highest charges for broadband service at $99 a month for the service and $499 for the initial equipment purchase as reported by CNBC[30] and others recently.

All and all, while Starlink will be helpful in bringing broadband service to portions of Clallam County that don't currently have it, and may need to be considered as a competitive factor in constructing new broadband infrastructure by any of the provider entities, it currently does not appear to be a "be and end all" technology to solve broadband issues in Clallam County. Nor does it currently promise to be able to provide the gigabit symmetrical services that fiber to the premises connectively would enable.

Fixed Wireless Providers

The existing fixed wireless providers in the County, primarily Olypen, CresComm and Nikola, provide a valuable service bringing higher speed Internet and broadband services to areas where the only other choice is sub-broadband service. Many of these providers currently work with the PUD to obtain fiber optic backhaul services from their towers and transmission facilities and continue to expand their networks as funding allows. Discussions with the providers indicate that they haven't yet largely pursued available grants and loan funds like other wireless ISPs have, because of some of the "strings attached" (i.e., reporting requirements, restrictions on use, and other limitations on how the funding is utilized related to the deployment of their network).

Public Model-Port Angeles

As discussed above, if the PUD receives and decides to pursue retail service delivery authority, it could develop, for example, fiber to the home services and develop a retail model. Individual jurisdictions, such as Port Angeles could also provide broadband services if they chose to invest in building, operating and maintaining a high-capacity broadband network providing services to homes and businesses.

In a City like Port Angeles, the business model would follow models similar to that in other cities like Anacortes, that have ventured down this path. It would leverage the power utility assets Port Angeles currently has, such as poles and any available conduits that could be used for broadband facilities. It would leverage technicians that already are certified for fiber deployment, based on the use of fiber for network communications, smart grid technologies and other applications

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[30] CNBC article dated 10/27/2020, "SpaceX prices Starlink satellite internet service at $99 per month, according to e-mail". https://www.cnbc.com/2020/10/27/spacex-starlink-service-priced-at-99-a-month-public-beta-test-begins.html

ancillary to power distribution, and a variety of back-office, customer service, billing, etc. capabilities that it already has for the power utility.

Even with this, it's an expensive proposition and in any case the implementation must consider the competitive impact. For example, with the other options currently available in Port Angeles, it would make sense that a fiber to the premises system that would help meet the State's 2028 goal, as well as connect any anchor institutions that did not already have the capability for gigabit service, would be the system build of choice. However, with the possibility of Wave upgrading its system to a fiber PON architecture, this could potentially end up being two competing FTTP networks where the take rates would be substantially lower than one FTTP system competing against an HFC system. As an example, the base cost of constructing a FTTP system for the entire City of Port Angeles would equate to approximately $7 Million. This cost is only for the fiber optic infrastructure on the poles and underground. This does not include any technical and engineering staff and equipment needs or any of the support needed to become an ISP, such as back-office support staff and equipment, climate-controlled equipment rooms, etc. Furthermore, this estimate is based solely on the distribution mileage of the City's power infrastructure. Depending upon how the project is financed, most likely by a combination of bond issuance, grants, loans and potential other public funding sources, would establish the ultimate payback period.

Anacortes, which is utilizing their water distribution facilities for its main fiber optic backbone installation, whereas the laterals are provided through traditional underground or aerial techniques, is a good example of how substantial public funding may be needed and, because of competition in the market place from other providers, the return on investment is lengthy. Anacortes' anticipated ROI is 15 to 20 years, based on an anticipated market share of 35%. The City indicates, based on initial take rates developed during the pilot phase of system development, that it could be cash flow positive by around Year 2, with construction continuing into Year 3.[31] In order to gain market share, its pricing is aggressive. Residential fiber-based Broadband Service is currently priced at the following: 100 Mbps-$39/per month; 1 Gbps-$69/per month; Installation fee-$100. Business service is a bit more costly at: 100 Mbps $89/per month; 1 Gbps $149/per month; One time installation fee-$100. There are also value-added services and dark fiber provision at negotiated rates.[32]

While publicly-owned and operated networks are always something to consider from a public policy perspective (in other words the residents and businesses of a jurisdiction having substantial control over their own Broadband destiny), any successful entity needs to be in it for the long haul, because the ultimate rewards are reaped not in months or necessarily years, but over decades.

RFP for a Public-Private Partner

We believe that pursuit of all the above scenarios combined would, within the timeframe specified by the State, work to substantially meet the States' goals. However, unless the PUD were to aggressively get into expansion of its fiber footprint and potentially pursue retail sales of fiber-to-

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[31] https://www.anacorteswa.gov/436/Fiber-Project-Background
[32] https://www.anacorteswa.gov/984/Access---Anacortes-Fiber-Internet

the-premises based services, such that there was always a public entity pursuing development of high-capacity connections to residents throughout the County, the CCBA will be spending much of its time, energy and resources on tracking and coordinating the efforts of private providers. Some of these, CCBA members will have agreements with, such as Wave, but for others such as CenturyLink and Starlink, it will have little control over their roll-out in the County. Accordingly, the Authority, at some point, if commercial efforts aren't proceeding at an acceptable pace, may wish to issue an RFP for a public-private partner. In this case, the private partner would benefit most by having substantial middle mile already being built out ahead of, or in conjunction with, its roll-out of most likely a FTTP fiber connectivity Broadband solution.

There are FTTP providers willing to make substantial capital investments. They believe because they are an FTTP provider that based on speed to market, they will be competing with technologies of lesser capabilities, and accordingly believe they would gain a substantial market share. These system builds typically start with smaller pilot projects; for example, building a section of a FTTP buildout from middle mile infrastructure where the only other option at the time of the pilot build is provision of substandard DSL.

The public partners, in this case the members of the CCBA, would need to work together to help speed entry into the market, including expediting permitting and helping the private partner overcome any regulatory hurdles, provide access to publicly-owned infrastructure, like PUD poles, including expediting make ready, and other activities. The CCBA would assist in awareness campaigns, participate in both in the original issuance of the RFP, and the choice of the private partner and, when service begins, provide service updates and other promotional efforts.

In essence, in this scenario, the private partner selected through the RFP could become the Authority's preferred choice for the provision of Broadband services within the County. The agreement, in this case, would have to provide assurances that ensure the greatest opportunity for a FTTP buildout throughout the majority of the County.

Since this type of public-private partnership would put pressure on existing commercial providers, it is possible that it could have a substantially negative impact on relationships between existing providers within the County and the members of the Authority. Accordingly, it is an option that is typically only pursued when other providers, given the opportunity, do not "step up to the plate", and make and meet commitments to expand and enhance Broadband in the County.

We have taken the number of miles of PUD electrical infrastructure and devised an estimate of 1, 550 miles of fiber optic infrastructure needed to extend from a middle mile network, as described above, once it is built. We used 1,550 miles of fiber optic infrastructure in a 60% underground and 40% aerial combination. It must be understood that the customer and/or the broadband service provider would likely be responsible for at least a portion of the cost of construction of a drop cable from a demarcation point on a pole or in an underground enclosure. These drops could measure several hundred feet in order to get to the home or business. We have provided details for this build in Exhibit M and provide a summary here.

First, we estimated the construction costs, including from network design to the last pole before the drop to be 930 miles of underground fiber optics and 620 miles of aerial cable. The total cost

is estimated at approximately $97,650,000. This estimated cost equates to about $2,800 per home passed in the County. We used 35,000 homes being passed by this network.

Table 14: Public/Private Partnership FTTP Build Scenario

Public/Private Partnership FTTP Build Scenario

(Expanded Middle Mile in Place)

		Miles	Total Costs	Cost per Mile
New Underground Fiber	60%	930	$74,400,000	$80,000
New Aerial Fiber	40%	620	$31,000,000	$50,000
New Fiber Optic Cable Estimate		1,550		
Total Estimated Cost		**$105,400,000**		
Total Homes		35,000		
Homes Per Mile of New Plant		22.58		
Estimated Cost per Home Passed		**$3,012**		

As further shown in Exhibit M, we use a grant of 50% of the total construction cost and then we estimate that the private partner would need to average about 7,770 retail customers, per year, to pay construction costs and 7-year loan costs over the course of ten years. If the same construction costs were financed with 10-year loans, the build would be paid off over 12 years but begin to operate with an operating surplus during the 8th year. There are, of course, many variables and specifics that would need to be added into such calculations, on top of a detailed design, prior to moving forward with such an arrangement. However, as these numbers, albeit estimations, show, such a buildout of the County is feasible if the right partner(s) and funding solution can be found.

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Section 7 – Summary of Key Findings and Recommendations

SECTION 7 – SUMMARY OF KEY FINDINGS AND RECOMMENDATIONS

CBG, in conjunction with the Community Broadband Team, has made the following key findings and recommendations, concerning the current state of Broadband in Clallam County, the current and future needs of residents, businesses and anchor institutions for Broadband infrastructure and services and feasible scenarios to enhance and expand Broadband to meet the needs and the State's goals. Specifically:

1. Over ¼ of County households do not have Broadband service available to them. As the effects of the COVID-19 pandemic have demonstrated even more dramatically, this lack of Broadband availability impacts critical aspects of their lives and livelihoods and will continue to do so until Broadband is available to them.

2. Businesses in the same geographic areas where Broadband isn't available which depend on online connectivity are disadvantaged over other businesses in the County and this impacts economic development overall.

3. Affordability is also a critical factor in the adoption of Broadband services. The cost of accessing Broadband was indicated by survey respondents as a significant inhibitor, and one of their top three most important future aspects of Broadband/Internet Access.

4. The COVID-19 pandemic has reinforced the importance of having publicly available Wi-Fi and no cost access to it. Public Wi-Fi locations have been the go-to work around for those who do not have Broadband at their residences.

5. Many areas that have Broadband availability, have a range of infrastructure and services to choose from. For example, in Sequim, Wave provides different tiers of cable modem-based Broadband access, CenturyLink provides DSL that can achieve Broadband speeds in certain locations, Wireless Broadband providers are available and CenturyLink, and the PUD utilizing private ISPs like Olypen, can provide fiber to the premises services in certain areas.

6. Beyond areas like Sequim and Port Angeles, though, there is a sharp drop off in Broadband availability with only one, or in many cases no, Broadband services to choose from.

7. To best expand the current reach of Broadband services, the most efficient path forward is an expansion from existing Broadband infrastructure. This includes, for example: expanding the PUD's existing network to add fiber optic middle mile for private partners to then connect residents and businesses; expanding Wave's Broadband footprint; and expanding the reach and capacity of fixed wireless Broadband systems both within and beyond their current footprint.

8. Implementation of new infrastructure and types of services in unserved areas and upgrades to infrastructure in areas currently served with Broadband is the best way to go beyond

minimum Broadband speeds and "leapfrog" towards the States 2028 goal. Specifically, this includes focusing on fiber to the premise connectivity for all new wireline services and upgrading existing HFC and DSL connections to FTTP infrastructure.

   a. In some cases, where the necessary ROI for FTTP can't yet be supported by a mixture of private, grant and public funding, at a minimum, fiber to the closest point of connection should be implemented with future high-capacity connections at 150 Mbps symmetrical service provided either through xDSL, fixed wireless or high-capacity satellite services like Starlink, as technology advances may allow.

9. Current local Right-of-Way (ROW) requirements in the County and municipalities do not seem to be a significant inhibitor to Broadband infrastructure development. In fact, franchise requirements that promote build-out can help extend Broadband service. Members of the Community Broadband Team (subsequently reconstituted as the Clallam County Broadband Authority) should though, continue to work with the State and its Broadband Office to pursue adjustments to any State ROW requirements that might unintentionally inhibit critical Broadband deployment (such as a recent review of DNR requirements). Overall, in order to meet the needs and the State's goals, there should be an aggressive push by public entities to pursue and facilitate Broadband expansion and enhancement.

10. Creation of a Broadband Authority with diverse representation from all pertinent groups in the County is the best way to ensure that Broadband expansion and enhancement will be pursued and achieved in an efficient and effective way. The most likely formal organization structure for the Broadband Authority is as a Public Development Authority (PDA).

11. The Management Plan would include:

   a. Establishment of the CCBA Board, representative of all the current members of the Broadband Team and other anchor institutions.

   b. A five-member Executive Board should be established

   c. A Manager/Director should be hired, or could potentially be contracted.

   d. Its Mission would be to coordinate between its members and their constituencies, collaborate with private providers, pursue all feasible funding avenues and help initiate and oversee a variety of public, private and public-private projects to help expand and enhance Broadband in the County.

   e. It would pursue the Vision established by the Team and work to achieve the associated goals established.

12. The initial Financial Commitment would come from the member organizations. The member organizations should be prepared to fully fund the Authority's operations for the

first two years, and during that period seek other support funding or revenues from projects initiated to assist in sustaining the Authority.

13. The Authority would pursue all types of funding mechanisms for both its members and public and private providers, based on the different funding initiatives at the federal, state, and local levels as well as through private capital markets; i.e., this would include pursuing all types of grants, private investments, public funding and potentially loans. This could include for example, funding sources[33] such as:

    a. Department of Commerce EDA Grants

    b. USDA Reconnect Program Grants and Loans

    c. Federal Funding from a variety of other sources, including continuing Covid-19 Relief funds such as the recently passed American Rescue Plan (ARP), whether directly focused on Broadband or filtering down from funds provided to State and local governments.

    d. Public Works Board funding

    e. Additional CERB funding, and

    f. Proposed new State funding sources similar to the VATI

14. If aggressive and progressive steps are taken first by the members of the Team, and then by the CCBA, between now and 2024, this should make minimum Broadband available to those who currently do <u>not</u> have access. Continuing on that track will further help meet the State's 2026 goal of 1 Gbps to every anchor institution and the 2028 goal, 150 Mbps symmetrical service to every home and business.

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[33] See Exhibit N for more detail on current and potential funding sources.