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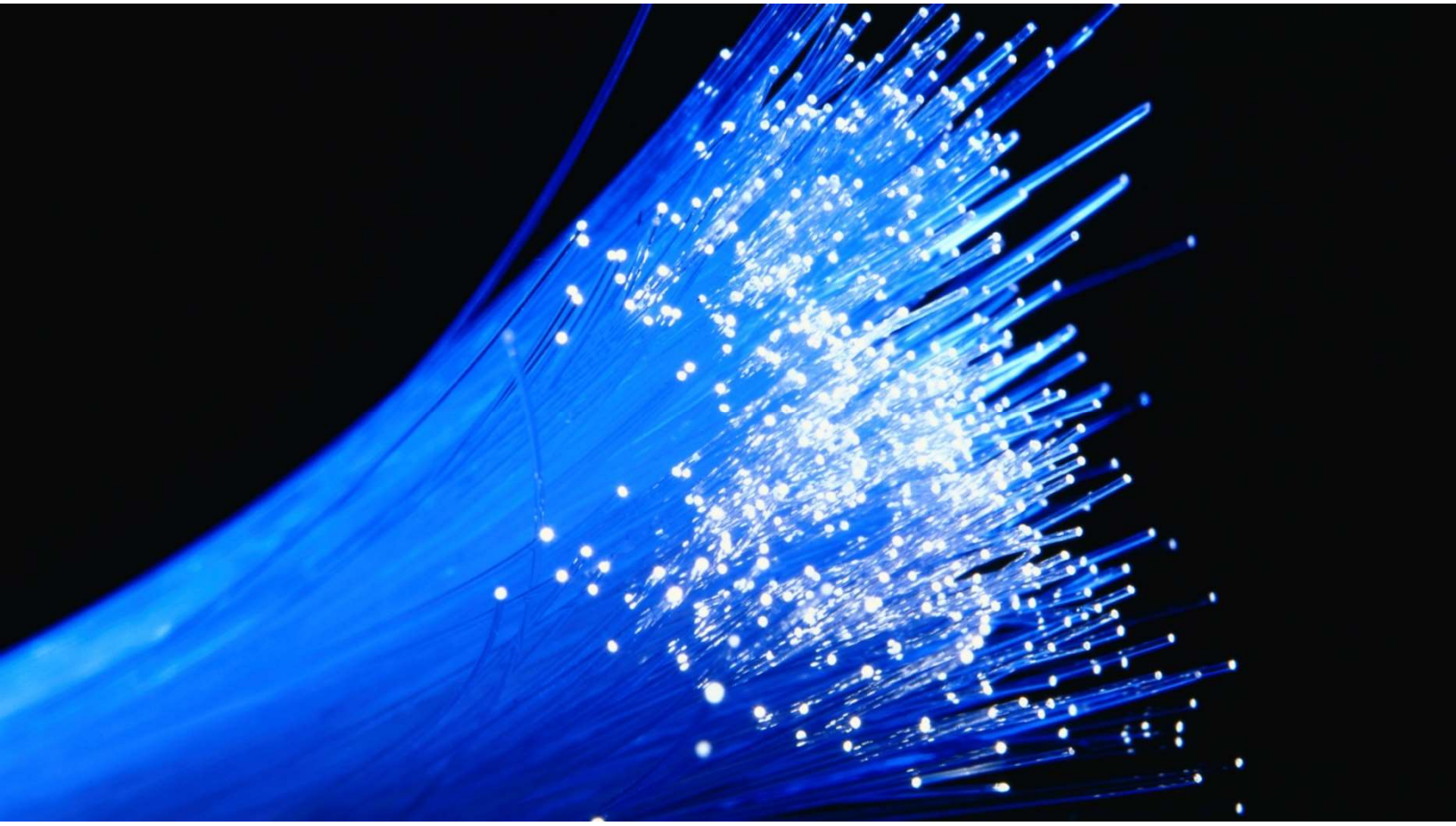

Broadband Strategic Master Plan

Prepared for Santa Cruz County, California

January 2024

Serving the Community | Working for the Future

COUNTY OF SANTA CRUZ

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1 Executive summary

The County of Santa Cruz, California commissioned this report in late 2022 with the goal of creating a Broadband Master Plan to guide the design, construction, implementation, maintenance, regulation, and funding of its fiber optics, wireless, and related broadband technologies. Key issues for the County included:

- Determining how to best utilize federal and state funding to deliver high-speed internet service;
- Understanding the unserved and underserved needs of County residents;
- Identifying areas where the County should construct County-owned infrastructure;
- Recognizing which public or private entities could be potential partners for the County; and
- Creating a long-term plan for maintaining and monetizing infrastructure assets.

The County engaged CTC Technology & Energy (CTC), an independent consultant, to assess the availability of broadband infrastructure and services in the County, engage stakeholders and residents to identify their needs and challenges around broadband, develop a high-level design and cost estimate to cover the needs of the entire county, and develop a funding strategy for infrastructure opportunities.

The project team performed the following tasks over the course of the engagement:

- Analyzed publicly available data from the Federal Communications Commission (FCC), the California Public Utilities Commission (CPUC), and internet service providers (ISP) to evaluate the County's broadband market (including both infrastructure and services) and identify unserved and underserved areas;
- Gathered feedback and data from stakeholders and the community through a series of meetings, a scientifically valid mail and online survey of residents, and an online speed test survey;
- Prepared a design and cost estimate for three candidate networks that could meet the County's goals, two using fiber-to-the-premises (FTTP) and one using fixed wireless; and
- Evaluated potential state and federal funding opportunities and business models for the candidate networks.

1.1 Key findings

The project team revealed the following throughout the course of the project:

- FCC data indicates that of the 80,061 addresses in the County, 76,087 (95.4 percent) are served at 100 Mbps download/20 Mbps upload (100/20), with **3,728 (4.6 percent) of locations unserved at less than 25/3. There are 57,645 locations (72 percent) of the County (both households and businesses) that do not have access to 100/100 Mbps speeds using fiber technologies**.[1] Topology in the County due to mountainous regions and dense foliage inhibits the buildout of ubiquitous fiber—and in some cases, wireless technologies.
- According to FCC data, 70,062 (87.5 percent) addresses are residential and 9,999 (12.5 percent) are business locations. Of these locations, **only 21,477 residences (30.6 percent) and 969 businesses (9.7 percent) currently have access to 100/100 Mbps speeds using fiber technologies**. Of the 3,728 unserved locations in the County, 1,900 (51 percent) are residential and 1,828 (49 percent) are business locations.
- **There is a lack of competition among ISPs**, with a significant portion of the County limited to only one option for a service provider. There are 37,983 (or 47.4 percent) of addresses in the County have access to only one provider that offers 100/20 Mbps service or greater.
- U.S. Census Bureau's American Community Survey (ACS) data found **20,932 households —representing approximately 21.7 percent of all Santa Cruz County households—lack a high-speed internet subscription** (via technologies such as cable, fiber optic or DSL). as compared to 23.4 percent statewide). [2] Approximately 13,139 households (13.6 percent) lack a desktop or laptop computer at home, which is slightly better than the statewide average of 16.7 percent.
- **Households that are eligible for the Affordable Connectivity Program (ACP) show subscription rates of only 28 percent** (approximately 11,411 of 40,454 eligible households), indicating that more low-income households could benefit from a low-cost program. AT&T, Comcast and Charter offer low-cost subscription plans for eligible households at $30 or less per month, which provide free service to enrolled ACP households.

[1] This Report relies on service availability data from the FCC Broadband Data Collection and National Broadband Map except where it discusses specific state programs and data analysis. The California Public Utilities Commission (CPUC) also has an extensive data collection and mapping system. The CPUC relies on a broader definition of "unserved locations" for its mapping, often resulting in higher numbers of unserved locations. See Section 6 below for further discussion.

[2] US Census Bureau, American Community Survey, 2021: ACS 5-Year Estimates. https://data.census.gov/table?text=internet&g=0400000US06_0500000US06087&tid=ACSST5Y2021.S2801 (accessed March 2023).

- A residential phone survey revealed that **although 96 percent of respondents say they have internet service, service reliability is a key problem.** Half of respondents (50 percent) reported that their service is moderately reliable, somewhat reliable or not at all reliable.
- **A network design and cost analysis show that a significant investment of $537 million would be required to build a FTTP network** to reach all locations not currently served by 100/100 speeds. The analysis also shows that building fiber to only households and businesses with current speeds of less than 100/20, approximately 4,000 locations, would be $297 million.
- **State and federal funding opportunities for infrastructure include the Federal Funding Account (FFA), California Advanced Services Fund (CASF) and the Broadband Equity, Access and Deployment (BEAD) programs.** Even with these funding sources, it will be a challenge to cover all the unserved areas in the County. The County should monitor the development of the BEAD rules and take proactive steps to educate policymakers about programs designs that will support the needs of the County's residents.

1.2 Recommendations

The project team formulated the following recommendations as a result of the study and analysis. They are grouped by estimated time frames for execution.

Short-term (6-12 months):

- To best position the County for BEAD funding, it would be optimal to **conduct financial and business modeling in early 2024** using varying assumptions to analyze potential costs and cost-avoidance measures, partnerships, grants, investments, and potential revenues. CTC has a significant portfolio of financial and business modelling assets it uses to assist government and private entities in the development of comprehensive broadband expansion programs. One option is a Grant Funding Optimization Tool referred to as the GOeS model that is used to highlight the implications of different broadband technology and grant choices and to inform policy and decision makers. A high-level overview of this capability is provided in Appendix H.
- Given that the County does not have the current fiscal support and resources to maintain a Countywide infrastructure, either in a closed or open broadband deployment, **the best partnership model for the County would be a Facilitation Model**, in which the County collaborates with ISPs to fill in the unserved gaps and provide support for the various state and federal funding programs. This would include providing letters of support on provider grant applications, clearing barriers to permitting, streamlining inspections processes, documenting and sharing County processes and assets, providing access to assets for

placement of wireless facilities and negotiating lease agreements for County-owned dark fiber.

- Since the final date for enrollment in the ACP program is February 7, 2024, the County should **stay apprised of future federal subsidy programs**. If a new program is put into place, the County can continue to promote it through its programming efforts with Santa Cruz Health and Human Services, Monterey Bay Economic Partnership, the Probation and Public Defender Office, and the Library's digital navigator program to address the internet service affordability issue.

Medium-term (2-5 years):

- To cover the entire County with 100/100 service or higher, **a hybrid approach of fiber, wireless, and satellite** will be required. Six FTTP hub locations would be required to reach the 57,626 locations not currently receiving a minimum of 100/100 Mbps, and costs for an all-fiber network are likely cost prohibitive ($536.7 million).

Ongoing:

- The County should continue to **engage closely with both City governments and higher education institutions regarding infrastructure upgrades**, particularly as they pertain to public safety issues and emergency communications.
- **Encouragement of competition among ISPs in the County will help improve high-speed internet service reliability in the long term.** Based on survey results and stakeholder feedback, problem areas exist due to a single provider serving many areas. Without the possibility of customers switching providers, ISPs have little to no incentive to upgrade their infrastructure or provide excellent customer support.
- The County should consider **facilitating conversations across relevant County departments** to better understand existing permitting processes for the deployment of broadband technology and develop guidelines for streamlining these processes. Conversations may also include municipal jurisdictions in the County of Santa Cruz and relevant state agencies.

2 ISPs report the County is largely served, but the market lacks competition, and cable is the dominant technology

This section summarizes the current state of residential broadband service availability and usage in Santa Cruz County. The assessment includes an inventory of the locations of residential fiber, cable, digital subscriber line (DSL), and wireless broadband services as reported by ISPs; an analysis of unserved and underserved areas of the County; an analysis of internet adoption data; and a summary of advertised pricing for available broadband services.

2.1 The County is largely served by broadband, but fiber coverage is limited

- **Most of the County's population is reported as served at 100/20** according to the FCC National Broadband Map, which is due primarily to cable service coverage. There are 3,728 locations that are unserved with less than 25/3 coverage, which represents 4.6 percent of the locations in the County.
- **Fiber broadband service is limited and has been deployed primarily in more urbanized regions** of the central and southern areas of the County; cable and fixed wireless providers cover large parts of the County that are not covered by fiber. Santa Cruz's topography has historically been a deterrent for large-scale fiber infrastructure builds due to the hilly terrain in more sparsely populated rural areas.
- **AT&T and Comcast are the dominant providers in the County**, although there are many other smaller players in the market. Charter Communications offers cable service; Cruzio, Surfnet, Etheric, and T-Mobile offer fixed wireless services. There are a few providers that offer business services, but only in small areas of the County.
- **There is a lack of ISP competition**, with a significant portion of the County having access to only one provider that offers 100/20 service or greater.
- **Approximately 21.7 percent of residents claim that they do not have high-speed internet in their homes**[3] contradicting the coverage reported to the FCC by providers that the County is largely served. This disconnect between access and subscriptions could be attributed, at least in part, to affordability issues and undersubscription of eligible households in the ACP – only 28 percent of eligible households currently participate.
- **There are very few "entry-level" service packages at lower tier price points** except for programs offering discounted services to qualifying low-income households. Research into the service offerings of the major service providers in the County mostly revealed

[3] US Census Bureau, American Community Survey, 2021: ACS 5-Year Estimates. https://data.census.gov/table?text=internet&g=0400000US06_0500000US06087&tid=ACSST5Y2021.S2801 (accessed March 2023).

plans with high data speeds that also come with high price tags, possibly requiring budget-strapped households to buy more than they need.

2.2 A note on data sources

This analysis is based on publicly available data, including the FCC's National Broadband Map and the U.S. Census Bureau's American Community Survey. (See Appendix A for more information.)

There are other public broadband availability data sets; however, the National Broadband Map was chosen as the primary source because it is the most granular, current, and comprehensive national dataset regarding broadband services at this time. The FCC has a coverage challenge process to refine the National Broadband Map which may impact the reported coverage in the County. The FCC updates the availability data in the National Broadband Map on an ongoing basis as it resolves challenges or receives additional updates and it will issue new versions of the entire map on approximately June 30 and November 30 of each year.[4] Therefore, the County should consider refreshing the analysis presented in this report regularly.

2.3 Overview of the broadband market structure

As a foundation for the analysis presented in the remainder of this report, this section briefly describes the structure of the broadband market, including deployed infrastructure, market participants, and customer segments.

The broadband market is divided by types of providers, types of services based on the use of infrastructure, and types of customers served. In larger metropolitan areas, long-haul fiber bridges the distance between cities, often connecting at data centers. In Santa Cruz County, the relevant infrastructure for this analysis consists of:

1. **Middle-mile fiber**, which delivers enterprise-level services to large businesses, institutions, and government clients in a local or regional area and connects wireline and wireless last-mile infrastructure with the long-haul network through "backhaul" services.

2. **Last-mile infrastructure** (fiber/wireline or wireless), which delivers consumer-grade services to residences and business-class services to small businesses.

Table 1 summarizes the broadband market for middle- and last-mile market segments. The sections below describe the middle-mile and last-mile segments specific to Santa Cruz County in more detail.

[4] Federal Communications Commission, Public Notice DA 23-69, January 25, 2023, https://docs.fcc.gov/public/attachments/DA-23-69A1.pdf (accessed February 20, 2023).

Table 1: Broadband market overview

	Infrastructure Provider Leverages real estate & infrastructure to support ISPs	Enterprise Service Provider Sells high-end services to sophisticated end users & ISPs	National Incumbent Operates regional networks to serve multiple segments	Local Incumbent Operates local networks to serve multiple segments
1. Middle Mile (transport & internet bandwidth) ISP customers				
2. Wireless Backhaul Wireless ISP customers				
3. Enterprise Business & institutional customers				
4. Business Class Small/medium business customers				
5. Consumer-Grade Residential & small business customers				

2.3.1 Middle-mile market segment

Middle-mile service providers connect last-mile ISPs (both wired and wireless) to the backbone of the internet at major data centers and other interconnection points. Middle-mile services include the following:

- **Transport** is a service from one point to another over a middle-mile network that enables the buyer to transport its traffic between its local network and a major network hub; this is a high-end service, often with service-level guarantees, that is used by more sophisticated ISPs.
- **Backhaul** is a type of service sold to other ISPs (primarily wireless) to "backhaul" their internet traffic from the neighborhood to the internet backbone; these are high-end services that may be delivered over lit or dark fiber.
- **Commodity internet bandwidth** enables local ISPs to put their traffic on the internet. It can be purchased locally (at the interconnection point with the middle-mile provider), offering simplicity for the local ISP, or at a data center (with transport services then necessary to move the bandwidth between the data center and the ISP's local network).

- **Interconnection services** allow ISPs to connect to the internet backbone and to each other; these include access to data centers or field exchange points; rack space at data centers; and access to splice enclosures or other interconnection elements.
- **Dark fiber** enables sophisticated ISPs to use their own electronics to "light" and operate fiber strands along a middle-mile route; the dark fiber owner offers physical maintenance guarantees and splicing and related services to access the fiber.

  A range of entities provide middle-mile services, though remote locations and cost effectiveness may create challenges for different types of last-mile ISPs to connect to these middle-mile providers:

- **Incumbents** operate large networks to support their own last-mile operations, both fixed and mobile; these providers sometimes sell middle-mile services to competitors. AT&T has the largest middle-mile fiber network of the incumbents serving Santa Cruz County. Frontier has very limited middle-mile facilities where it serves as the local incumbent last-mile provider.
- **Infrastructure companies** deploy network infrastructure assets and bundle access to those assets including fiber, wireless towers, and "small cells" on street furniture to sell middle-mile services to ISPs. Companies like Crown Castle, CENIC, Extenet, and CenturyLink are considered infrastructure companies in the County.
- **Enterprise ISPs** may or may not deploy their own network infrastructure, but their primary business model is to sell very high-end middle-mile (and last-mile) services to sophisticated users, including last-mile ISPs, multi-location business enterprises, and large anchor institutions.
- **Platform companies** such as Google and Meta own massive long-haul and middle-mile fiber networks to support their own needs; in limited cases, these assets are also used to deliver services to ISPs.

2.3.2 Last-mile market segment

ISPs offer a range of data services over the last-mile portions of their networks to residences, businesses, institutions—and to other ISPs. Last-mile services and customer types include the following:

- **Consumer-grade internet** services are sold to households and cost-conscious small businesses; these are "best efforts" rather than guaranteed levels of service, which is indicated by advertisements for speeds "up to" a certain level.
- **Business-class internet** services are sold to many smaller and mid-size businesses that require a bit more support than households; these are still "best efforts," but they may

include symmetry (i.e., matching download and upload speeds), lower levels of oversubscription (meaning the infrastructure will be supporting fewer customers), and prioritization at the ISP's network operations center.

- **Enterprise-level services** are the services sold to sophisticated institutions and businesses that require "quality of service" guarantees; these are high-end services that include point-to-point transport and point-to-point dark fiber.

Key last-mile market players include incumbent, competitive, and mobile/fixed wireless providers:

- **Incumbent providers** include "telephone companies" like AT&T and Frontier offering voice and internet over legacy copper, DSL, or (in limited cases) fiber infrastructure, as well as cable companies such as Comcast and Charter (Spectrum) offering internet over legacy cable TV infrastructure and some newly built fiber infrastructure in core downtown areas.
- **Competitive providers** include fiber-to-the-premises (FTTP) providers like Cruzio, Digital West, Vast Networks, and NetFortis, as well as fixed wireless providers like Cruzio, Surfnet, and Etheric. Sonic is another competitive provider offering internet access over DSL at this time and has no fiber infrastructure. Wave (now Astound) also has limited cable infrastructure in the County. Competitive providers include smaller, niche, and community providers as well as larger enterprises and they market to a mix of residential and business customers. These providers often have to "over-build" [5] the legacy incumbent networks to bring newer technology into the area. In Santa Cruz County fixed wireless is a significant portion of the technology used by competitive providers.
- **Mobile companies** such as AT&T, Verizon, and T-Mobile also offer "fixed wireless" services in the last mile, though with entirely different service attributes and utility than competitive providers such as Cruzio. In Santa Cruz County, these incumbent mobile providers include very small amounts of fixed wireless concentrated in urban core areas. As these incumbent providers expand their 5G networks over the next several years, and resellers (or Mobile Virtual Network Operators) such as Tracfone market services over those networks, faster and more reliable fixed wireless may become increasingly available.

[5] Overbuilding in the telecom industry is defined as utilizing an existing telecommunications operator's network (which includes telco and cable networks) to provide service to customers. For example: when a fiber network is built in the same right-of-way or on an aerial pole line where an existing network exists, whether it's copper, coax, or wireless.

2.4 "Served" locations in Santa Cruz County are primarily subscribed to cable service

Research conducted for this assessment revealed four primary residential ISPs in Santa Cruz County:

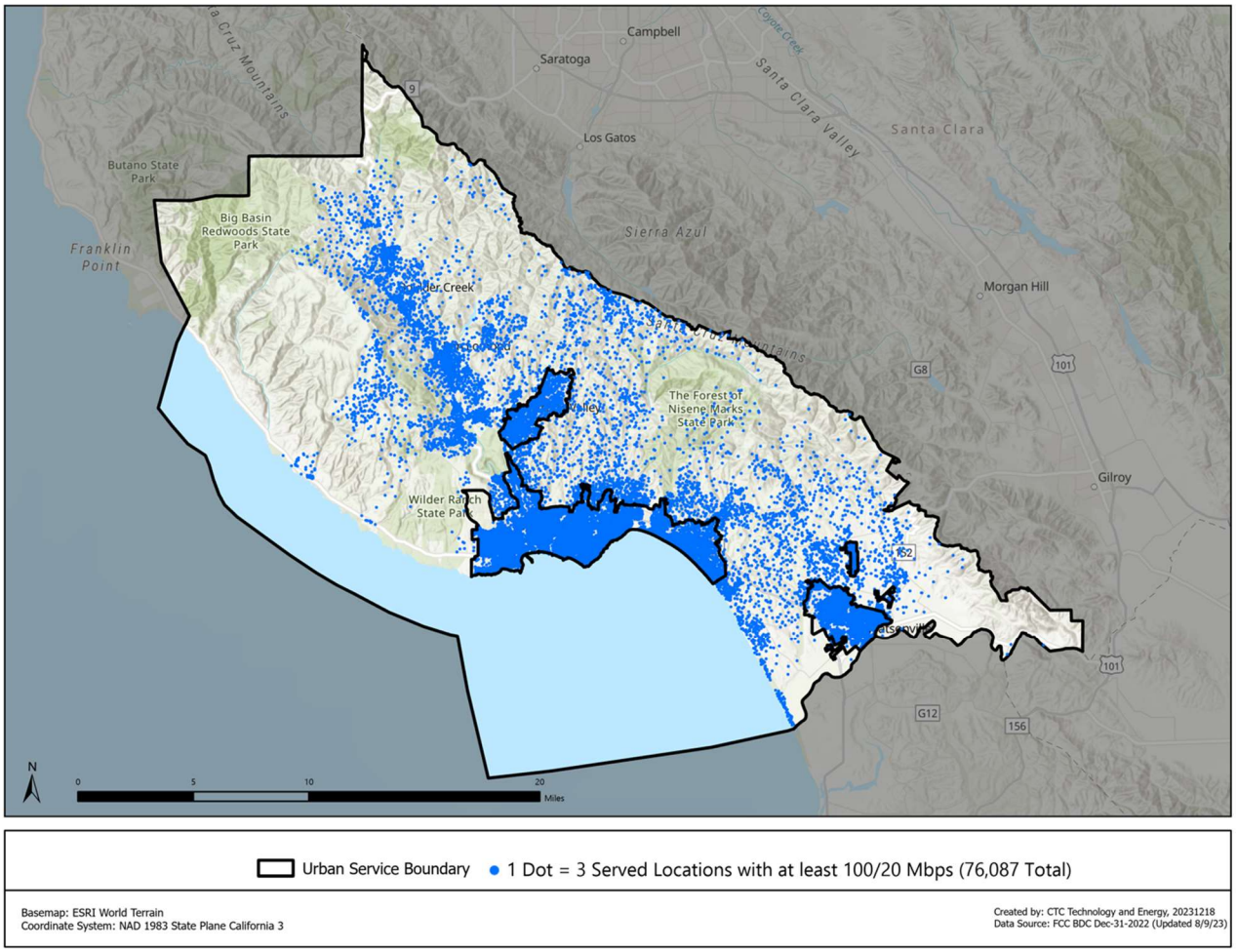
- **AT&T** provides fiber and DSL broadband services.
- **Cruzio Internet** provides fiber and fixed wireless broadband services.
- **Charter Communications** provides cable broadband services.
- **Comcast** provides cable broadband services.

Additionally, **Surfnet, Etheric** and **T-Mobile** provide fixed wireless broadband services, and **Frontier Communications** and **Sonic.net** provide DSL services.

With the passage of the Infrastructure Investment and Jobs Act (IIJA) by Congress, policy makers generally consider 100/20 as the minimum threshold for modern day broadband usage, and therefore these are considered "served" areas. Any service offering between 25/3 and 100/20 falls into an "underserved" area.[6] New infrastructure initiated through federal funding requires minimum 100/100 speeds, with only special considerations allowing funding for 100/20 Mbps. During this study the County considered speed options and determined that it favored future-proof technology at speeds of 100/100 Mbps or higher, and therefore future build assumptions were made on this premise (a general guide detailing the necessary broadband speeds to effectively perform various tasks online – such as telework and telehealth video conferencing, remote learning, online computer gaming, Netflix and other internet surfing – for a family of four can be viewed in Appendix F). Most of the County has access to broadband at speeds of at least 100/20, including fiber, fixed wireless, and cable services as shown in Figure 1:

[6] "NTIA's Role in Implementing the Broadband Provisions of the 2021 Infrastructure Investment and Jobs Act," NTIA, https://broadbandusa.ntia.doc.gov/news/latest-news/ntias-role-implementing-broadband-provisions-2021-infrastructure-investment-and.

Figure 1: Broadband coverage at 100/20 Mbps



2.4.1 Fiber broadband availability

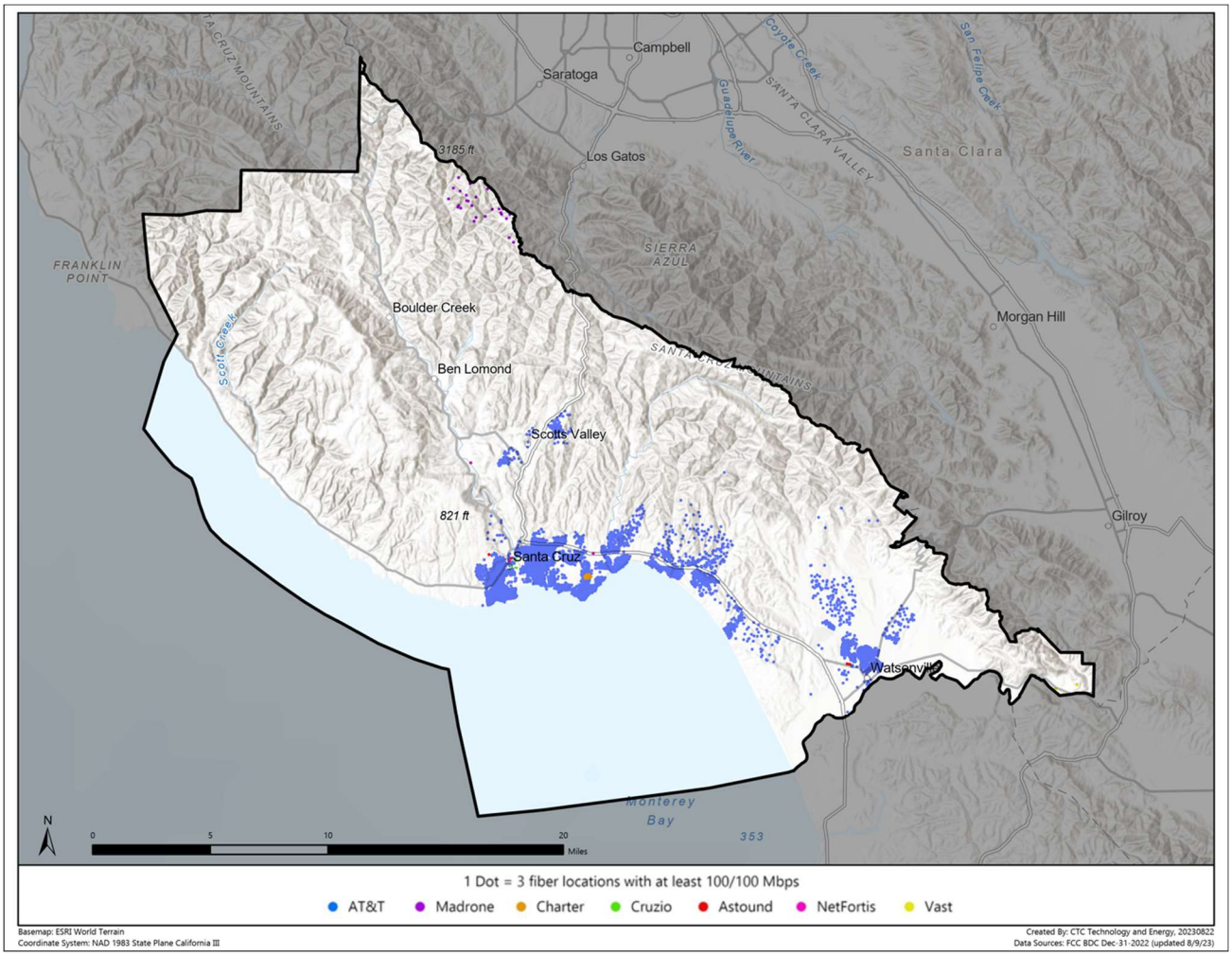
The FCC's National Broadband Map suggests that fiber investment primarily exists in the City of Santa Cruz and the southern region of Santa Cruz County. Fiber investment in the northern half of the County has been minimal. AT&T is the primary residential fiber broadband provider in the County, with very small pockets of residential fiber service reported by Cruzio, Charter, Madrone and Astound. NetFortis and Vast Networks provide fiber exclusively to businesses.

As shown in Figure 2, AT&T has reported coverage that extends throughout the City of Santa Cruz, in the majority of Corralitos, Watsonville, Interlaken, Ben Lomond, and Aptos, and pockets of Rio Del Mar and La Selva Beach. As the incumbent local phone service provider for most of the County, AT&T has significant existing copper facilities in the area that it has slowly been converting to fiber facilities over the past decade.

Cruzio reports fiber coverage within the City of Santa Cruz. Madrone, a community broadband venture, provides minimal coverage in a small area on the County line north of Boulder Creek.

NetFortis, a cloud communications company in the enterprise services market, has reported coverage in three small regions—in Santa Cruz, along the Cabrillo Highway near Capitola, and south of Felton. Finally, Vast Networks reports coverage along the southernmost border of Santa Cruz County, and Charter Communications Inc. claims to serve small regions north of Santa Cruz and Watsonville and in west Watsonville, respectively.

Figure 2: Fiber providers at 100/100 Mbps or greater



Fiber investment in Santa Cruz County currently exists primarily in urban areas, which only account for a small portion of the entire County. Due to the County's topography and relatively low density in certain areas, large-scale buildouts of fiber infrastructure in non-urban settings are very costly and do not provide sufficient return on investment. This is notable in the northern portion of the County where the terrain is challenging and fiber coverage remains minimal.

While these urban population centers and cities in the County have fiber coverage at 100/100 Mbps, there is little competition in these areas and throughout the County. AT&T appears to face

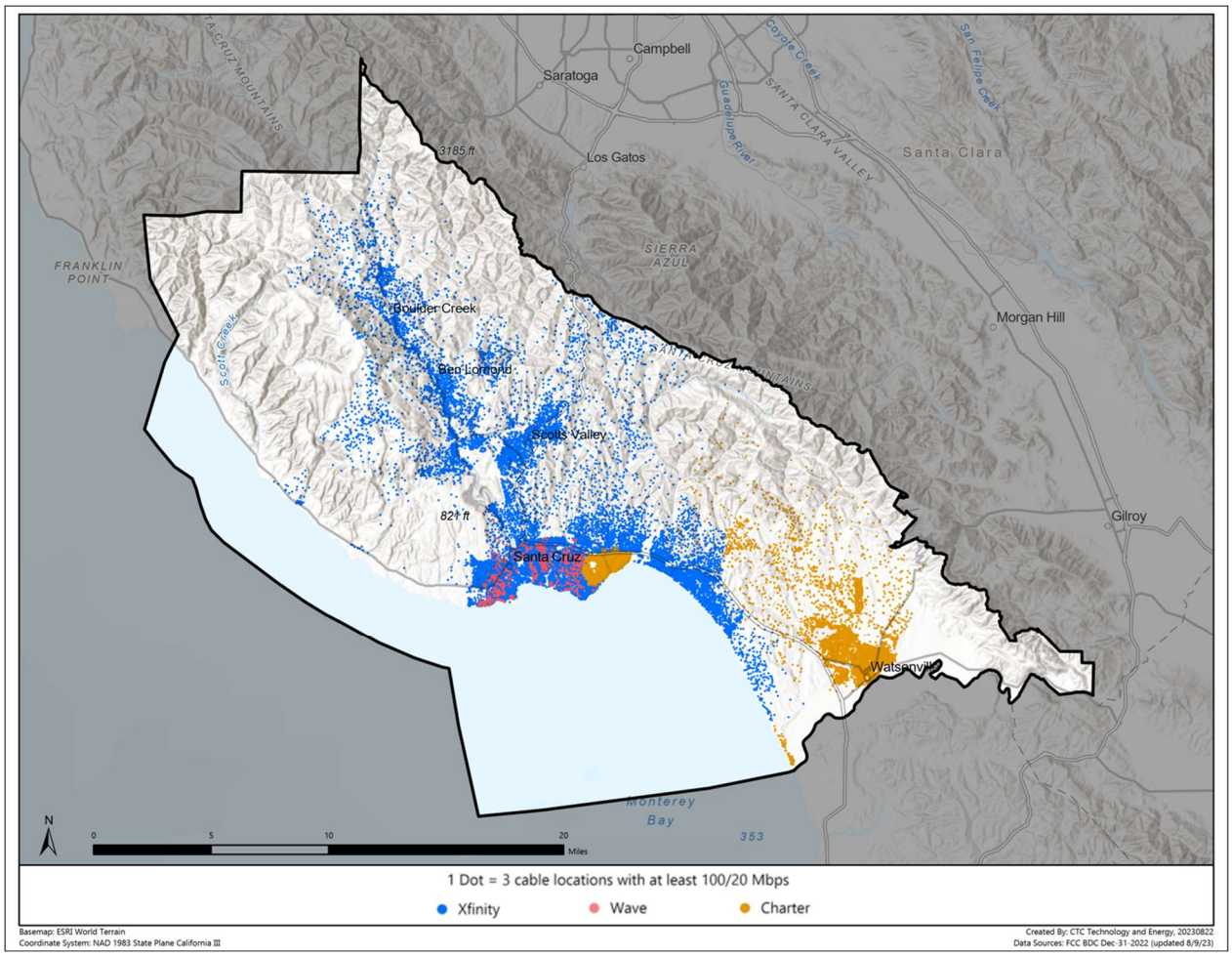
little competition except in small areas mostly concentrated in the city centers from cable providers and fixed wireless providers.

2.4.2 Cable broadband availability

Comcast (Xfinity) is the dominant cable provider and reportedly covers a significant area of Santa Cruz County with its legacy cable infrastructure. Areas excluded from Comcast's reported coverage are along the northern border of the County, the northeast and northwest regions, and along the southeastern region. There is some overlap in Comcast's coverage in the southern part of the County where Charter Communications Inc. reports coverage in Capitola, Day Valley, Corralitos, Freedom, and Watsonville. Wave Networks also shows some coverage with its cable network in downtown Santa Cruz and small pockets of other areas. Wave (formerly RCN Networks) is a competitive cable provider that was recently purchased and has re-branded itself as Astound Networks. It is unclear if Astound is currently marketing or selling services in the County and if it has any plans for expansion or conversion to fiber facilities within the County.

While cable coverage exists across the majority of the County in both urban and rural areas, most residents have the ability to subscribe to only one cable provider.

Figure 3: Cable providers at 100/20 Mbps or greater

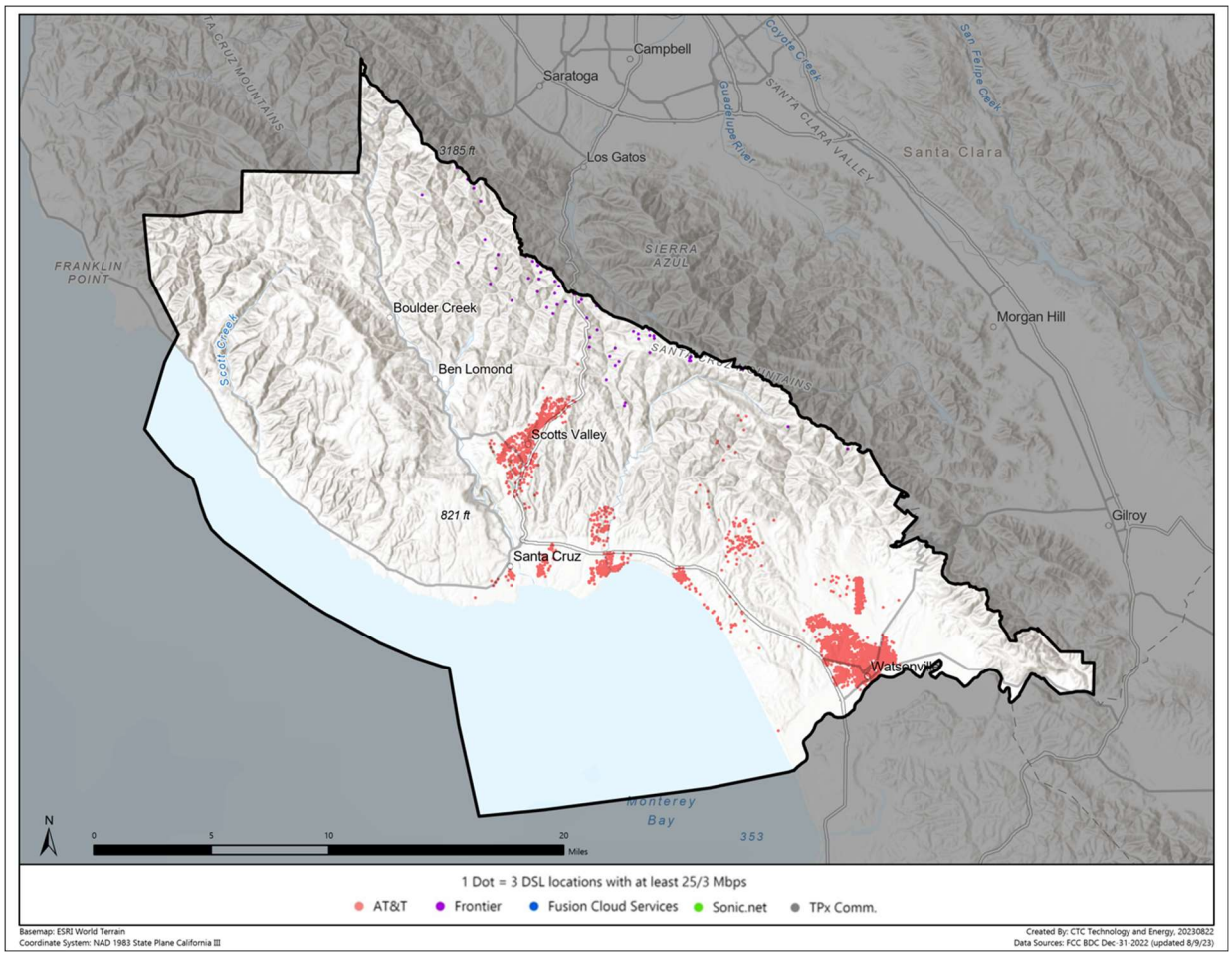


2.4.3 DSL broadband availability

Based on reported coverage from the FCC's National Broadband Map, AT&T is the dominant DSL provider in Santa Cruz County with coverage in Scotts Valley, the Aptos Hills and Day Valley, Corralitos, Freedom, and Watsonville, and a small pocket in the northeast around Castle Rock State Park. Frontier's coverage extends along the majority of the eastern border of the County from just south of Castle Rock State Park to Corralitos.

Sonic.net, TPx Communications and Fusion Cloud Services show very small areas of coverage in the County.

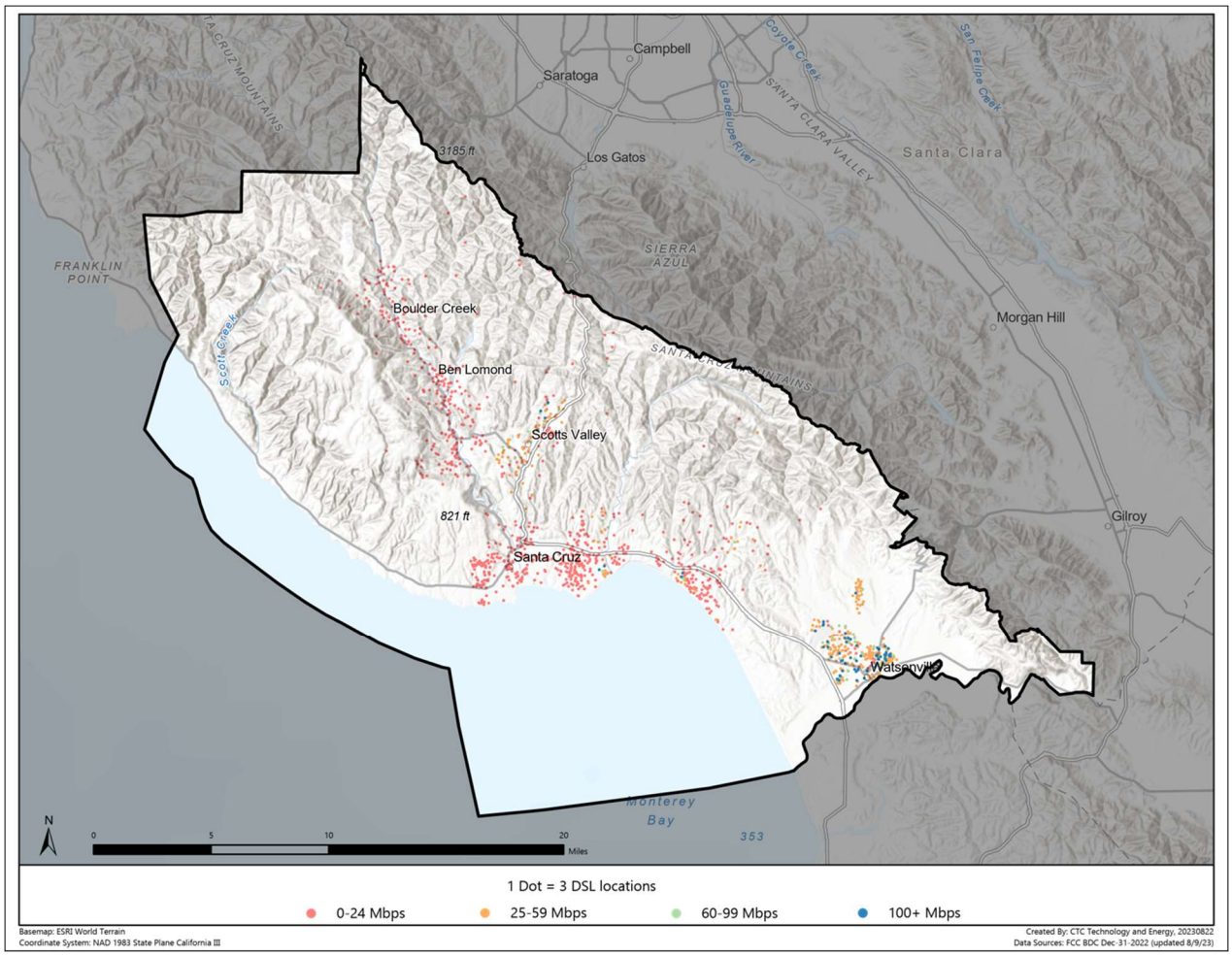
Figure 4: DSL providers at 25/3 Mbps or greater



Reported DSL download speeds in cities across Santa Cruz County vary significantly. However, in the County's rural and unincorporated areas, DSL download speeds typically range from 0 to 24 Mbps (see Figure 5), which is under the threshold of "served" set at 25/3 Mbps by both federal and state regulators.[7] Some areas near Watsonville show download speeds of DSL at 25 Mbps or above.

[7] See CA Public Utilities Code §281 (b)(1)(ii) (defining "unserved area" as an area where there is no provider offering service with speeds above 25/3 Mbps); See also, Federal Communications Commission, Fourteenth Broadband Deployment Report, GN Docket 20-269, FCC 21-18 (January 19, 2021), paragraph 12 (defining "advanced communications services" as meeting minimum standard of 25/3 Mbps and above.); See also, Infrastructure Investment and Jobs Act, Division F, Title I (Broadband Grants), https://www.congress.gov/bill/117th-congress/house-bill/3684/text (accessed February 16, 2023).

Figure 5: Reported DSL download speeds



2.4.4 Fixed wireless availability

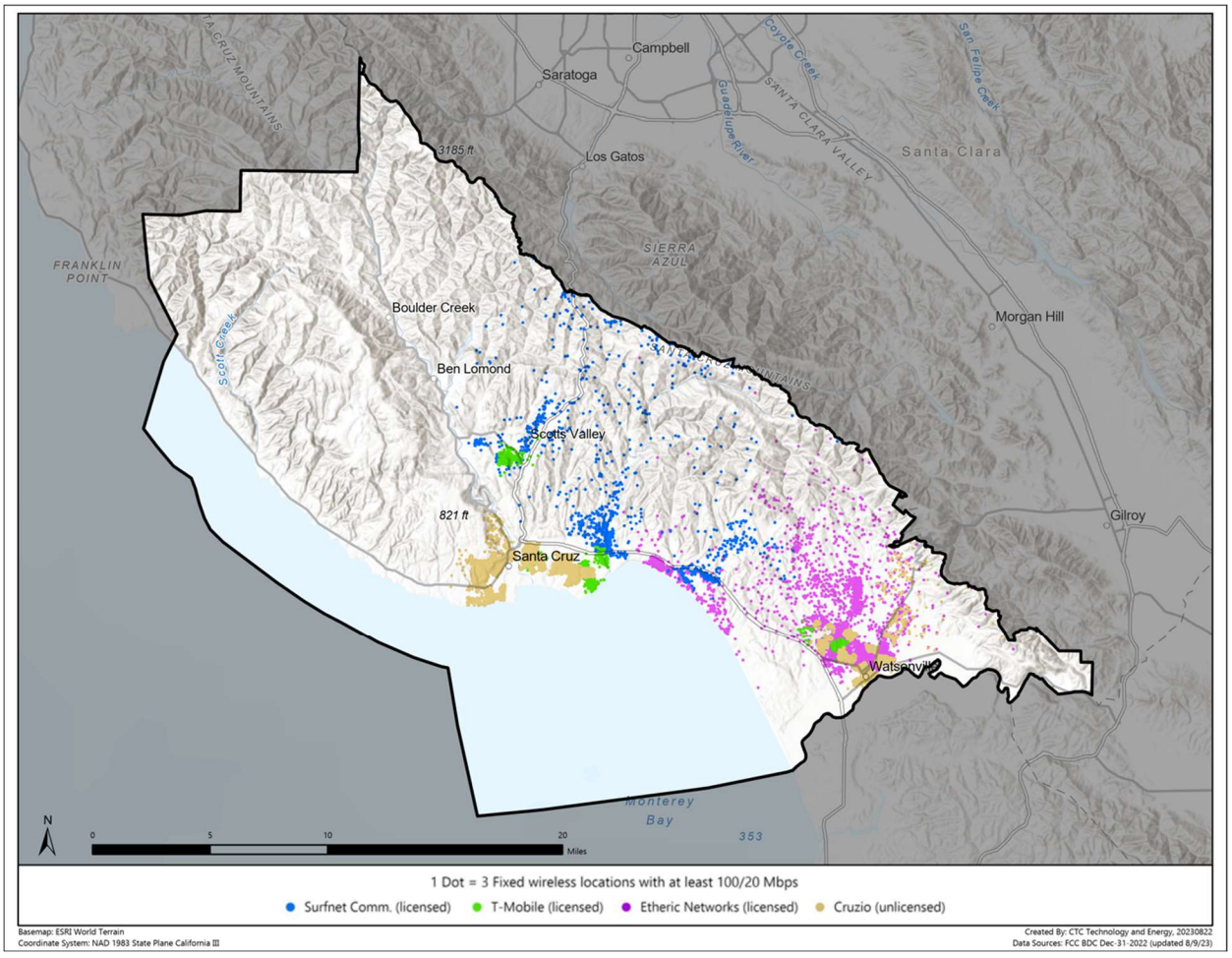
There are four fixed wireless providers in the County. Surfnet Communications reports coverage across the central region, primarily through the Santa Cruz Mountains and along the eastern border of the county from just below Beatty Ridge in the north to Corralitos in the south. Etheric Networks serves the southern part of the County, including south Santa Cruz, Watsonville, and Pajaro Valley to the border with San Benito and Santa Clara counties.

Cruzio serves the City of Santa Cruz, Scotts Valley, Corralitos, Freedom, Interlaken, and Watsonville. Cruzio deploys both fixed wireless and fiber infrastructure in Santa Cruz County; however, due to the County's topography, Cruzio relies more on the deployment of fixed wireless to new service areas. Cruzio reports that fixed wireless has been relatively faster to deploy and lower cost than fiber infrastructure in certain parts of the County. Cruzio also noted that last-mile fixed wireless infrastructure was able to withstand the damage of winter storms in early 2023, as opposed to outages due to fallen wireline fiber. Additionally, T-Mobile reports some small

pockets of fixed wireless coverage in Scotts Valley, Freedom, and the southeastern region of the City of Santa Cruz.

It is important to note that fixed wireless coverage areas and speeds are typically an approximation; locations within the reported area may not be able to receive signal due to line-of-sight limitations between the tower and the premises. Additionally, some fixed wireless providers use a combination of licensed and unlicensed spectrum to provide broadband services in the County.[8] While residential end users should generally not notice a difference in service quality between the two technologies, services that rely upon unlicensed spectrum may experience service quality and performance reductions more frequently than those with licensed spectrum.

Figure 6: Fixed wireless broadband coverage at 100/20 Mbps or greater



[8] The FCC National Broadband Map reports that Etheric, and Surf.net use a combination of licensed and unlicensed fixed wireless, T-Mobile uses licensed fixed wireless, and Cruzio relies only on unlicensed fixed wireless technology to serve the County.

2.4.5 Unserved and underserved areas are primarily in the northern region of Santa Cruz County

Under the broadband definitions included in the 2021 Infrastructure Investment and Jobs Act (IIJA),[9] unserved areas are those lacking access to 25/3 Mbps broadband, and underserved areas are those lacking access to 100/20 Mbps broadband.

Based on the FCC's National Broadband Map, there are scattered unserved locations throughout the County, with a higher concentration of unserved locations in the Santa Cruz Mountains. There are a total of 3,728 unserved locations in Santa Cruz County, which equates to approximately 4.6 percent of the total housing units.[10] Figure 6 below shows the unserved locations in Santa Cruz County, as determined by FCC reporting; the inverse of this map is shown in Figure 1, above, which depicts the areas of the County where services offering speeds at 100/20 Mbps or higher are available. As shown in Figure 6, the unserved locations are highly dispersed throughout the County, therefore making them difficult to discern on the overall 100/20 Mbps coverage map. Figure 7 shows areas that are underserved, with speeds between 25/3 Mbps and 100/20 Mbps.

[9] "Infrastructure Investment and Jobs Act, Division F, Title I, Section 60102 (Broadband Grants), https://www.congress.gov/bill/117th-congress/house-bill/3684/text (accessed February 16, 2023).
[10] FCC Broadband Data Collection as of December 31, 2022 (with updates to service availability data as of August 9, 2023).

Figure 6: Unserved residential areas with broadband access of less than 25/3 Mbps

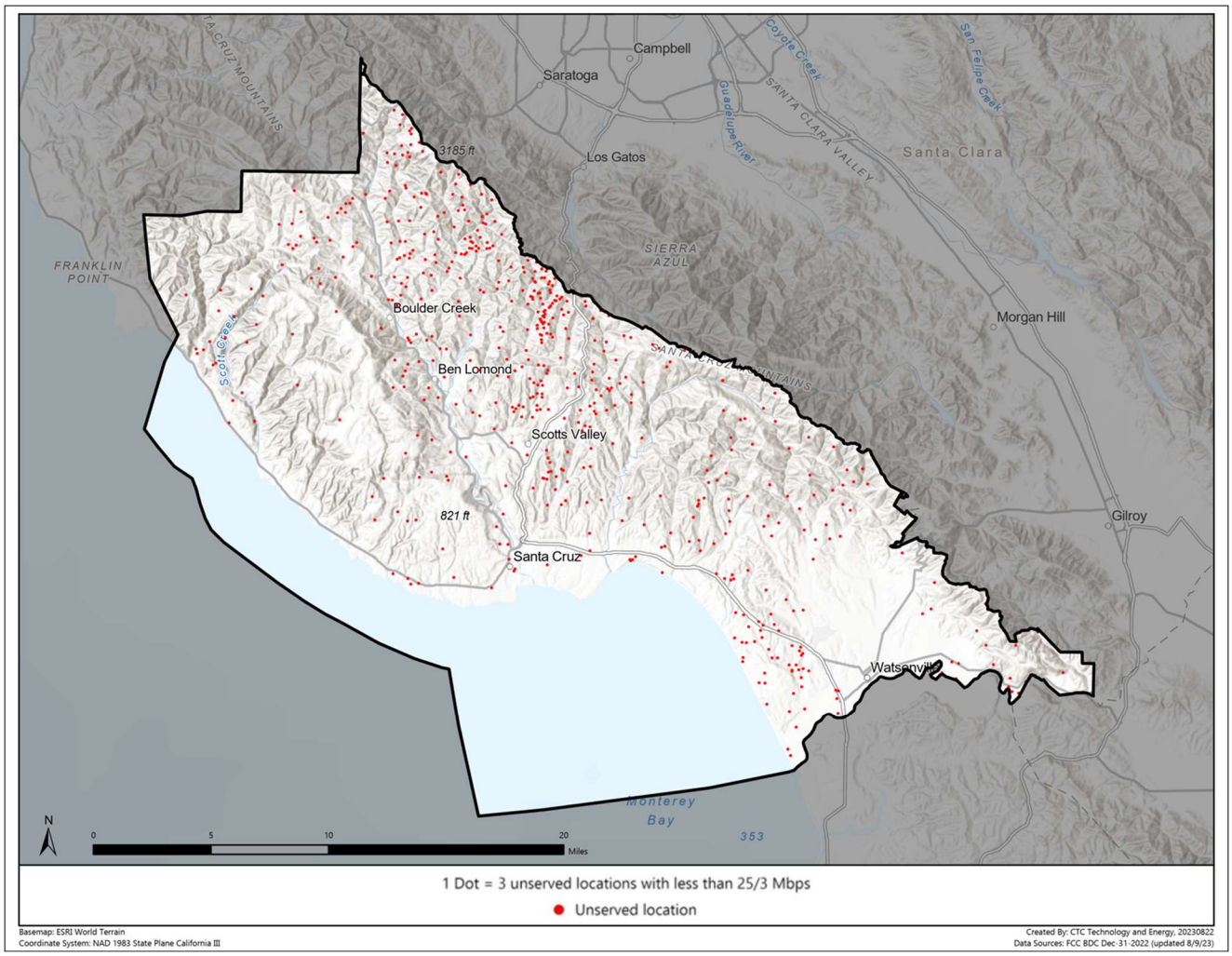
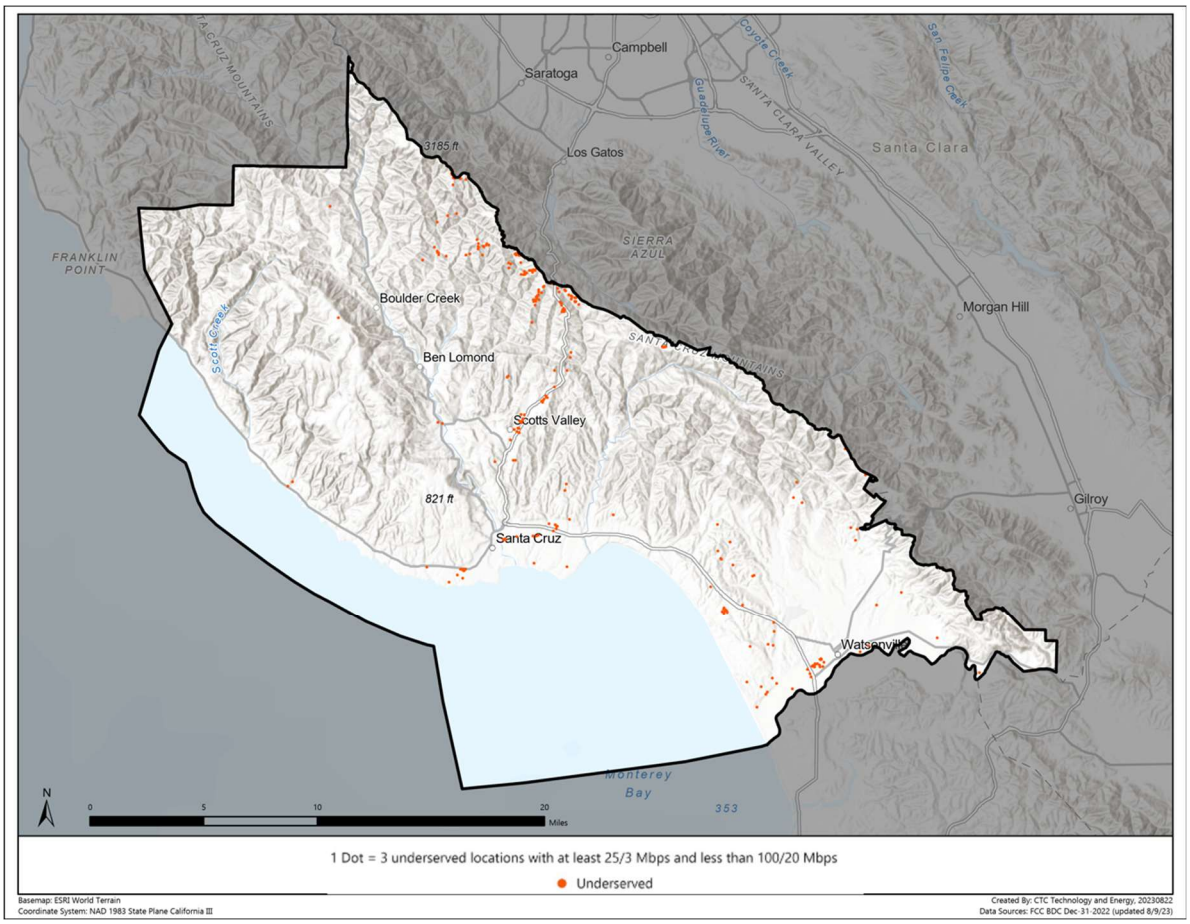


Figure 7: Underserved areas with broadband greater than 25/3 but less than 100/20



While a relatively small percentage of the County's population is unserved according to ISP-reported coverage, there are 37,983 addresses that are reported to have access to only one provider at 100/20 Mbps (see Figure 8). This is especially true of cable coverage in the San Lorenzo Valley. This lack of competition eliminates the ability for households to choose from different options to find subscriptions that best suit their needs at a price they can afford. Instead, households may be forced into subscriptions with contracts that are undesirable and services that may be insufficient, unreliable, or unaffordable to the consumer. Low density areas have a higher likelihood of only a single provider offering speeds above 100/20 Mbps as shown in Figure 9.

Figure 8: Areas with access to only one provider at 100/20 Mbps or greater

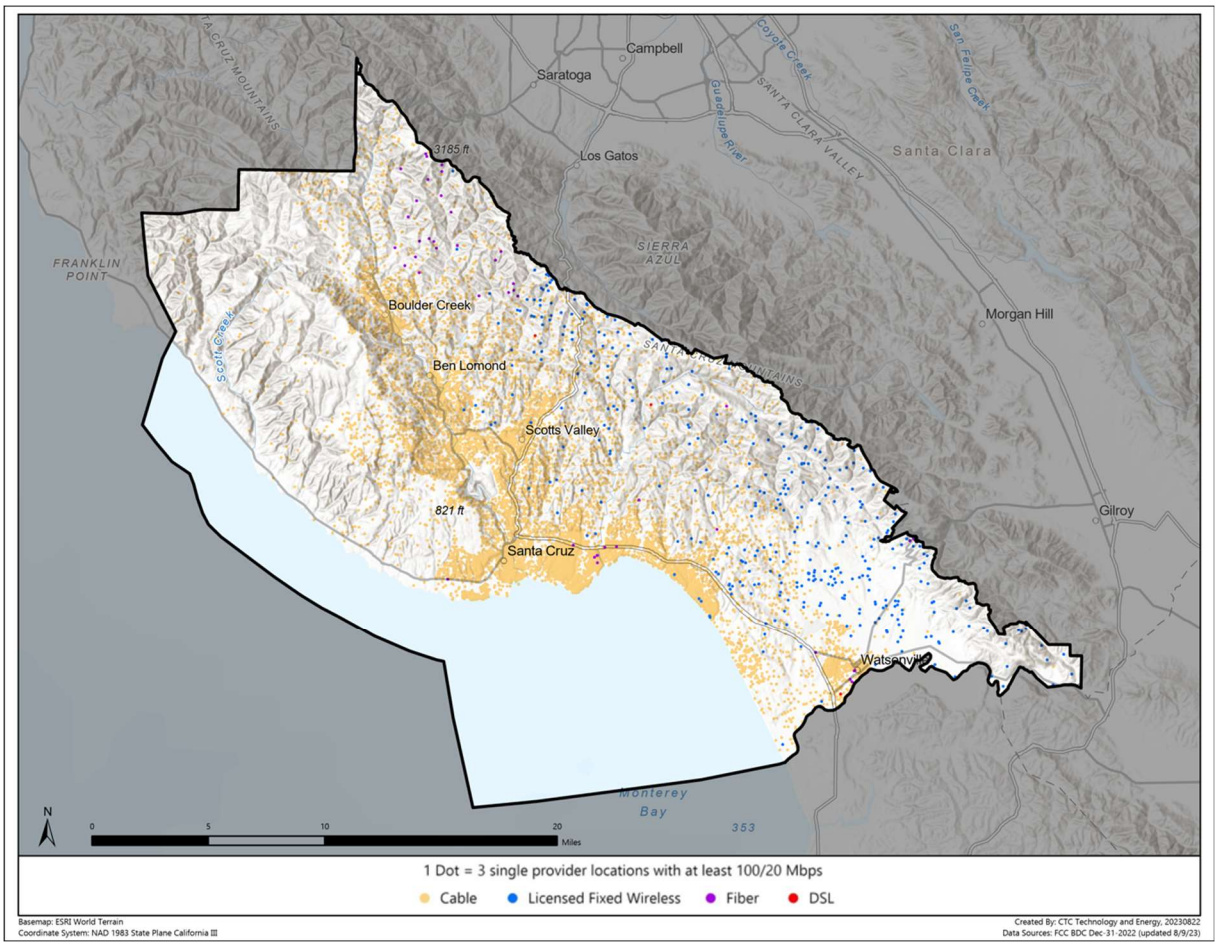
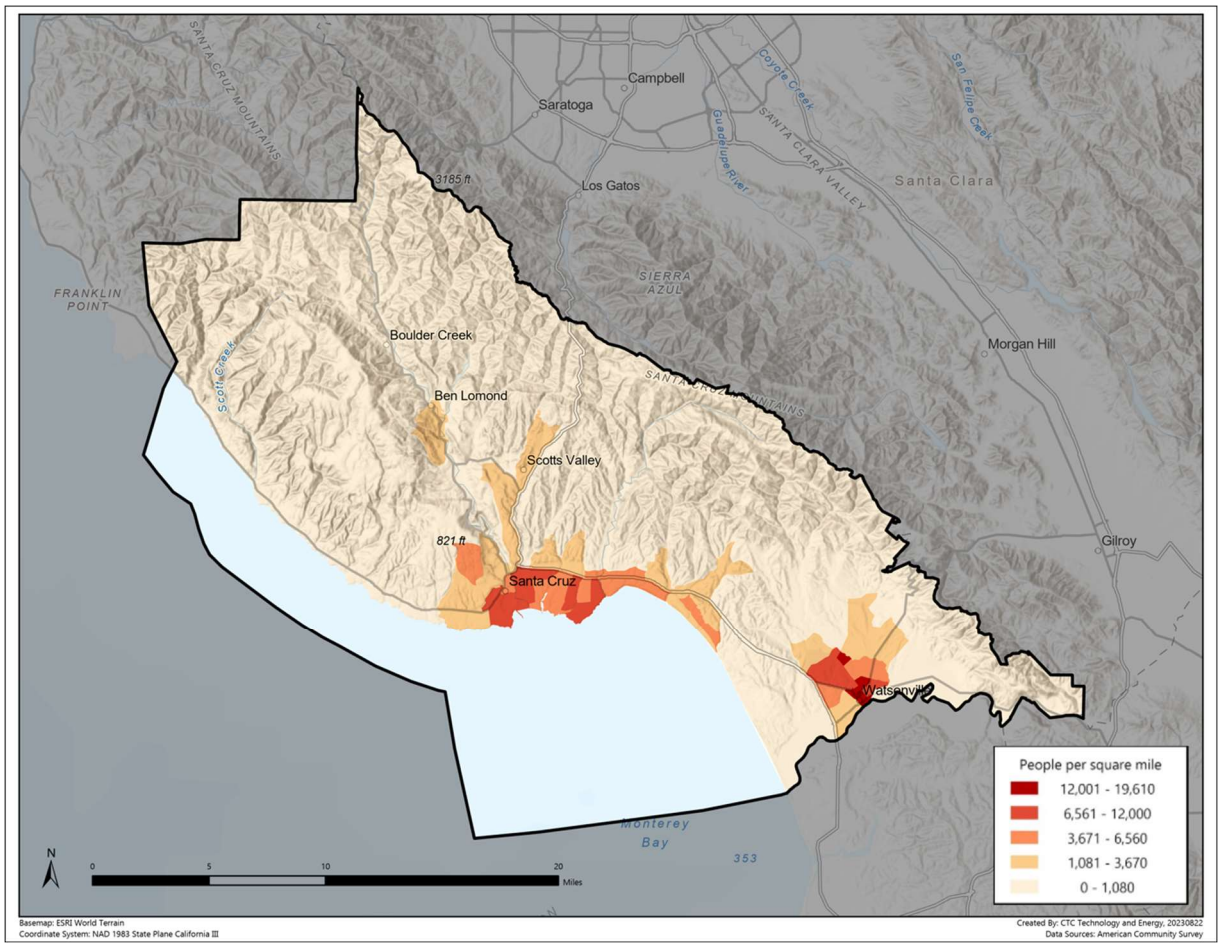


Figure 9: Population density in Santa Cruz County



In addition to the FCC National Broadband Map, the California Public Utilities Commission (CPUC) has also performed a detailed analysis of unserved and underserved areas in the County as part of its implementation of the Last Mile Federal Funding Account (FFA) infrastructure grant program.

In 2021, the California State Legislature allocated $2 billion to open a last-mile federal funding program ("Federal Funding Account Program"). The Legislature directed the CPUC to administer the program and split the allocation evenly between rural and urban areas.[11] As part of its statutory mandate, the CPUC designated urban vs. rural counties based on a formula that uses 2019 data.[12] Using this formula, the CPUC has categorized Santa Cruz County as an urban county

[11] SB 4, Chapter 671 (October 8, 2021), Section 2 (revised Public Utilities Code Section 281(n)), https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=202120220SB4 (accessed April 13, 2022). The funding is mostly federal funding from the American Rescue Plan Act, including both Capital Projects Fund and State and Local Fiscal Recovery Funds, as well as smaller contributions of state funds.

[12] SB 4, Chapter 671 (October 8, 2021), Section 2 (Pub. Util. Code §281(n)(3)(A)(ii)), https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=202120220SB4; Public Utilities Commission of

and allocated $10.3 million under FFA to fund broadband infrastructure projects located in the County. The three-month application window opened on June 30, 2023. Funded last-mile projects must be completed within two years of receiving authorization to construct.

The CPUC's intent is to support applications for broadband projects where it believes spending on broadband infrastructure will be the most effective and equitable use of federal subsidy funding. The CPUC spent several months developing a series scoring criteria and cost and project models to develop program materials. It incorporated multiple data sets, modeling, and mapping to identify priority areas for funding for the FFA. In addition to whether an area is served by broadband speeds, the analysis considered availability and subscription data, demographic and income level data, and other economic and environmental variables designed to evaluate each potential proposed funding area submitted by the providers for each county.[13]

For the Federal Funding Account program, the CPUC shows a location as "unserved" if the location lacks access to reliable broadband speeds of at least 25 Mbps download and 3 Mbps upload or if the location is only served by "legacy technologies" such as DSL and cable technology DOCSIS 2.0 or lower.[14] Areas that receive speeds between 25/3 Mbps and 100/20 Mbps, identified as "underserved" locations on the FCC National Broadband Map, are not eligible for funding except for locations only served by legacy technologies. The CPUC allows providers to present an evidence-based challenge to the determination that an area is unserved, including those areas served by legacy technologies.

Figure 10 shows the most current CPUC Federal Funding Account map for Santa Cruz County.[15] The CPUC will provide additional points for applications that include low-income and

the State of California, "Decision Adopting Federal Funding Account Rules," (D.22-04-055), Order Instituting Rulemaking Regarding Broadband Infrastructure Deployment and to Support Service Providers in the State of California, Rulemaking 20-09-001, April 22, 2022, pp. 32-35 ("FFA Decision"), https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M470/K543/470543650.PDF.

[13] Cost Quest, "California Broadband Analysis, Federal Funding Account Priority Areas, Process Overview and Methods," CPUC, December 2022, https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/communications-division/documents/broadband-implementation-for-california/priority-areas-webpage/ca-broadband-analysis-priority-areas.pdf.

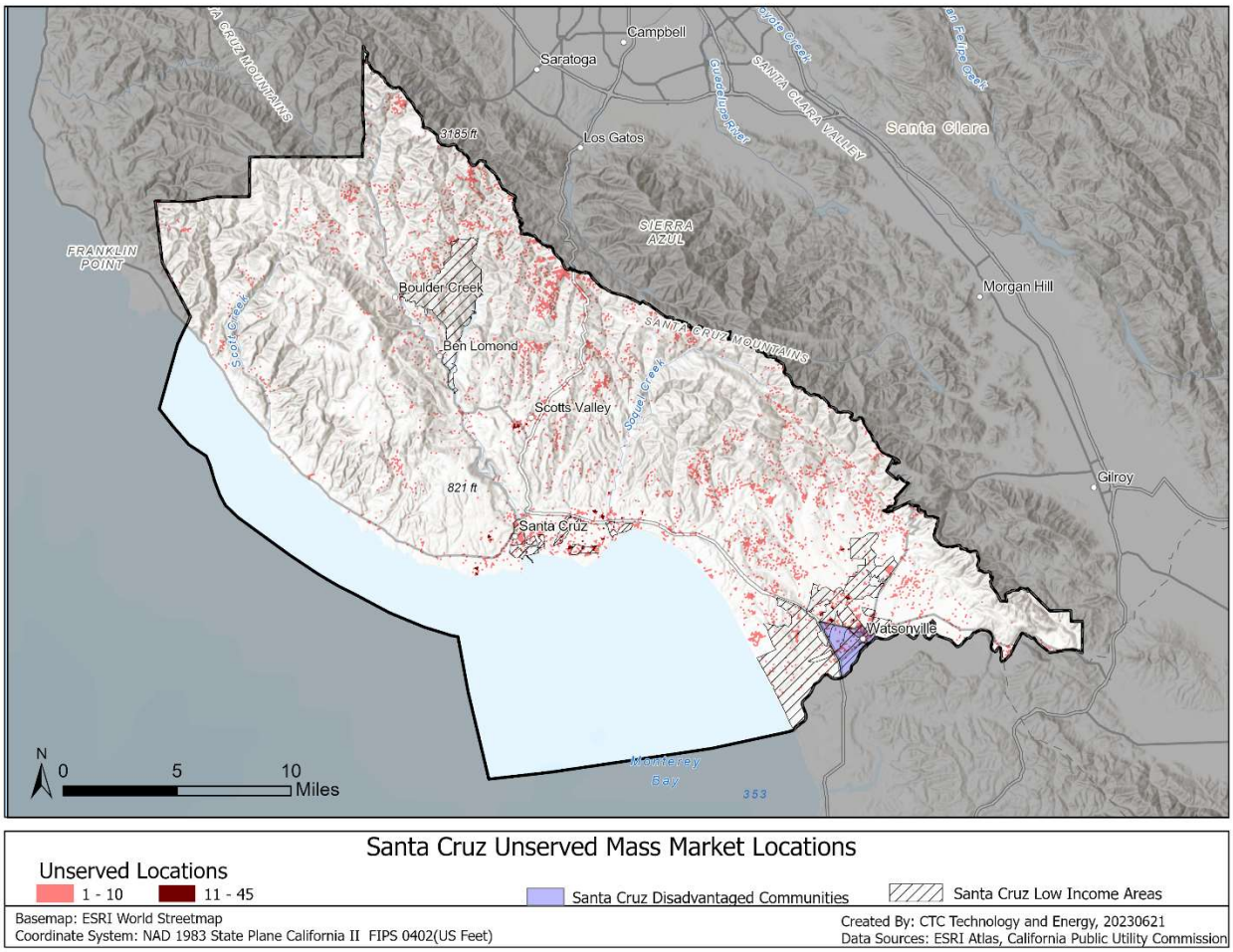
[14] See, CPUC FFA Decision, pp. 32-35, https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M470/K543/470543650.PDF; See also, Federal Funding Account, Last Mile, Frequently Asked Questions (April 2023), https://www.cpuc.ca.gov/-/media/CPUC%20Website/Files/uploadedFiles/CPUC_Public_Website/Content/Utilities_and_Industries/Communications_-_Telecommunications_and_Broadband/FFA%20Webpage%202023-04/FFA%20FAQs%20V2.pdf.

[15] CPUC Federal Funding Account Map, version 2 (May 2023) (this version of the map uses FCC National Broadband Data Collection service availability data as of June 2022 and service provider data reported to the CPUC as of December 2021.)

disadvantaged communities.[16] Based on CPUC data, areas of Watsonville, Boulder Creek and three small areas in Santa Cruz, Live Oak, and Capitola would fall into these areas. Though applications for FFA may fall in other areas of the County, the areas on the map below will have a higher likelihood of funding based on the guidelines.

Further discussion about the opportunity for federal and state funding to expand broadband in the County, including additional detail about the FFA, is in Section 6.

Figure 10: CPUC priority areas for Santa Cruz County



2.5 Data analysis suggests many County residents within ISP coverage areas are not subscribed to internet service

Observing internet adoption and usage patterns in the County is important to fully understand the nature of the digital divide. While many households are prevented from meaningful internet

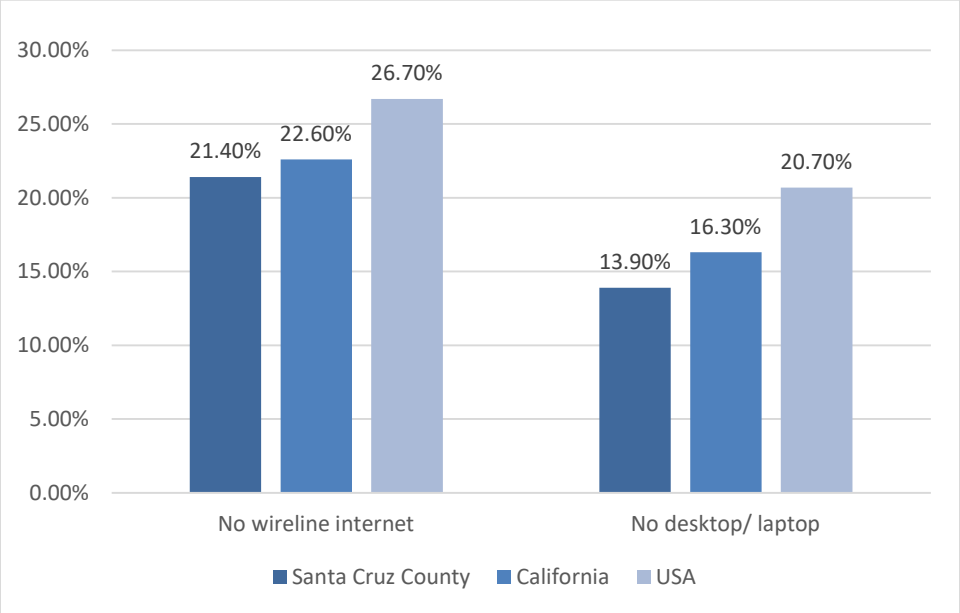
[16] Public Utilities Commission of the State of California, "Appendix A (Federal Funding Account Program Rules and Guidelines)," (D.22-04-055), Order Instituting Rulemaking Regarding Broadband Infrastructure Deployment and to Support Service Providers in the State of California, Rulemaking 20-09-001, April 22, 2022, section 3g. https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M470/K481/470481278.PDF

access by a lack of infrastructure and broadband access, others may reside in covered areas and still face barriers—with the most common obstacle being the affordability and reliability of internet services and computer devices. In addition, end users may not have the requisite skills to meaningfully use online resources.

In Santa Cruz County, 21.4 percent of (or 20,671) households lack a high-speed internet subscription (as compared to 22.6 percent statewide). [17] Approximately 13,400 households (13.9 percent) lack a desktop or laptop computer at home, which is slightly better than the statewide average of 16.3 percent.[18]

Currently, only 28 percent of estimated eligible households in the County have enrolled in the ACP.[19] This data suggest that County residents could benefit from financial support for internet service costs. The ACP will stop accepting applications on February 7, 2024. Currently, though successors programs have been proposed, there is no firm plan in place to continue a subsidy for low-income households for internet service. ACP enrollment rates are still important to note as an illustration of the gap in adoption due to lack of affordability and the potential for enrollment in a future subsidy program.

Figure 11: No access to wireline internet or a desktop/laptop device



[17] US Census Bureau, American Community Survey, 2021: ACS 5-Year Estimates. https://data.census.gov/table?text=internet&g=0400000US06_0500000US06087&tid=ACSST5Y2021.S2801 (accessed March 2023).
[18] Id.
[19] "ACP Enrollment and Claims Tracker," USAC, October 2023, https://www.usac.org/about/affordable-connectivity-program/acp-enrollment-and-claims-tracker/

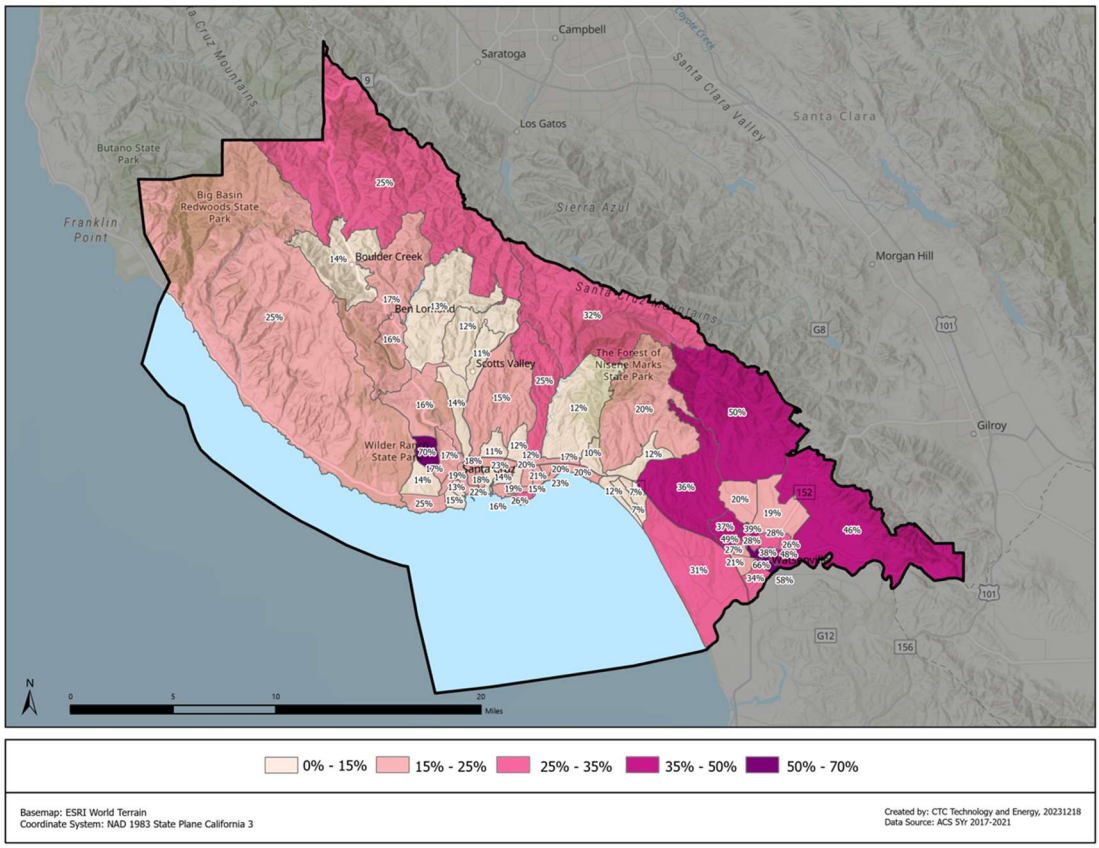
2.5.1 Internet subscription rates decline in areas with higher poverty

Analysis of the U.S. Census Bureau's American Community Survey (ACS) data found that levels of household internet subscriptions and computer ownership vary across the County. ACS data shows that 20,671 households – representing approximately 21.4 percent of all Santa Cruz County households – lack a high-speed internet subscription (via technologies such as cable, fiber optic or DSL).[20] Figure 12 breaks down this statistic further by showing the percentage of households without a high-speed internet subscription throughout the County.

Households without a high-speed internet subscription are concentrated along the northwestern coast, and more inland near Ben Lomond, Corralitos and its surrounding area, Watsonville, and the City of Santa Cruz. As previously discussed, many of these areas are situated within existing coverage footprints but suffer from a lack of competition at higher service speeds, potentially making service unaffordable and reinforcing residents' inability or lack of interest to obtain internet services.

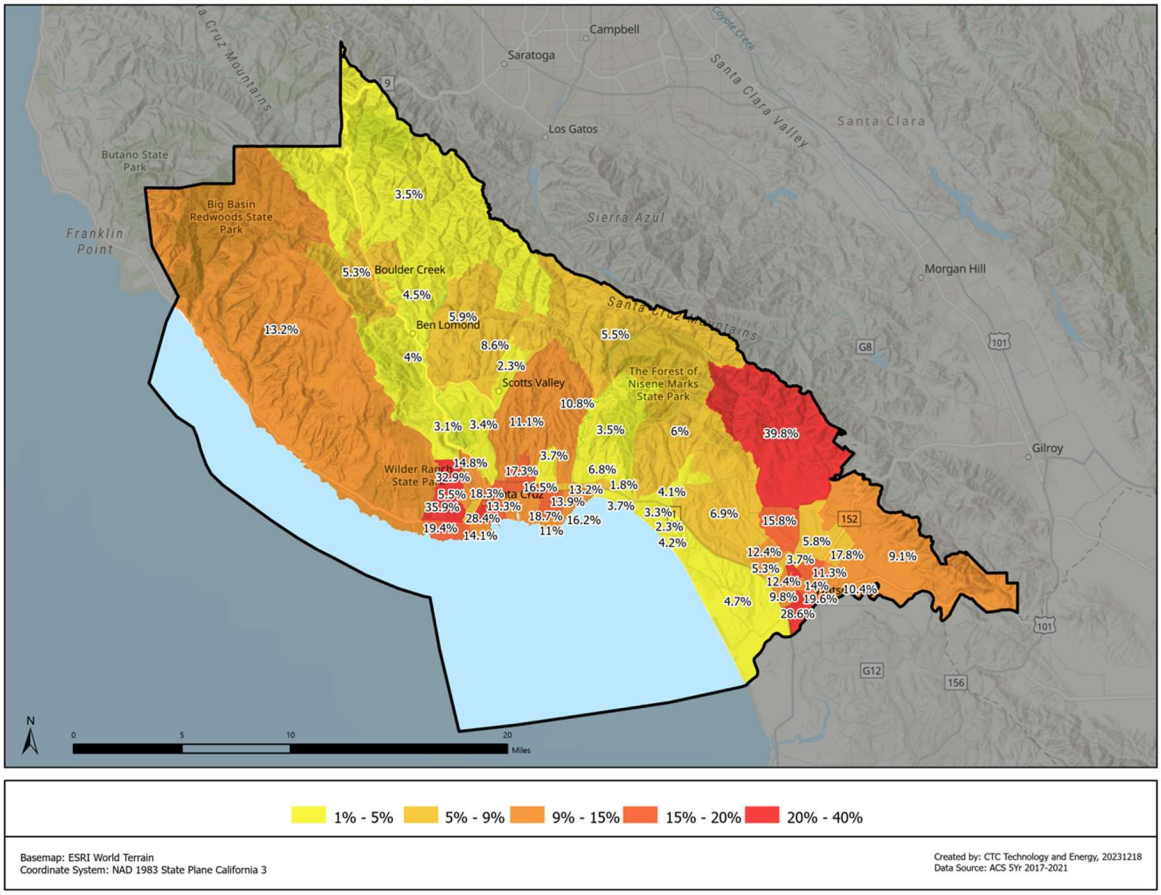
[20] US Census Bureau, American Community Survey, 2021: ACS 5-Year Estimates. https://data.census.gov/table?text=internet&g=0400000US06_0500000US06087&tid=ACSST5Y2021.S2801 (accessed March 2023).

Figure 12: Percent of households without a high-speed internet subscription (fiber, DSL, cable, or fixed wireless)



Throughout the County, internet subscription rates trend downward as the number of households below the poverty level increases in a given census tract (shown in Figure 13). Lower income areas do not have high-speed internet subscriptions at the same rates as higher income areas. While this may be expected, it provides more evidence of a need for financial support or subsidies for low-income households.

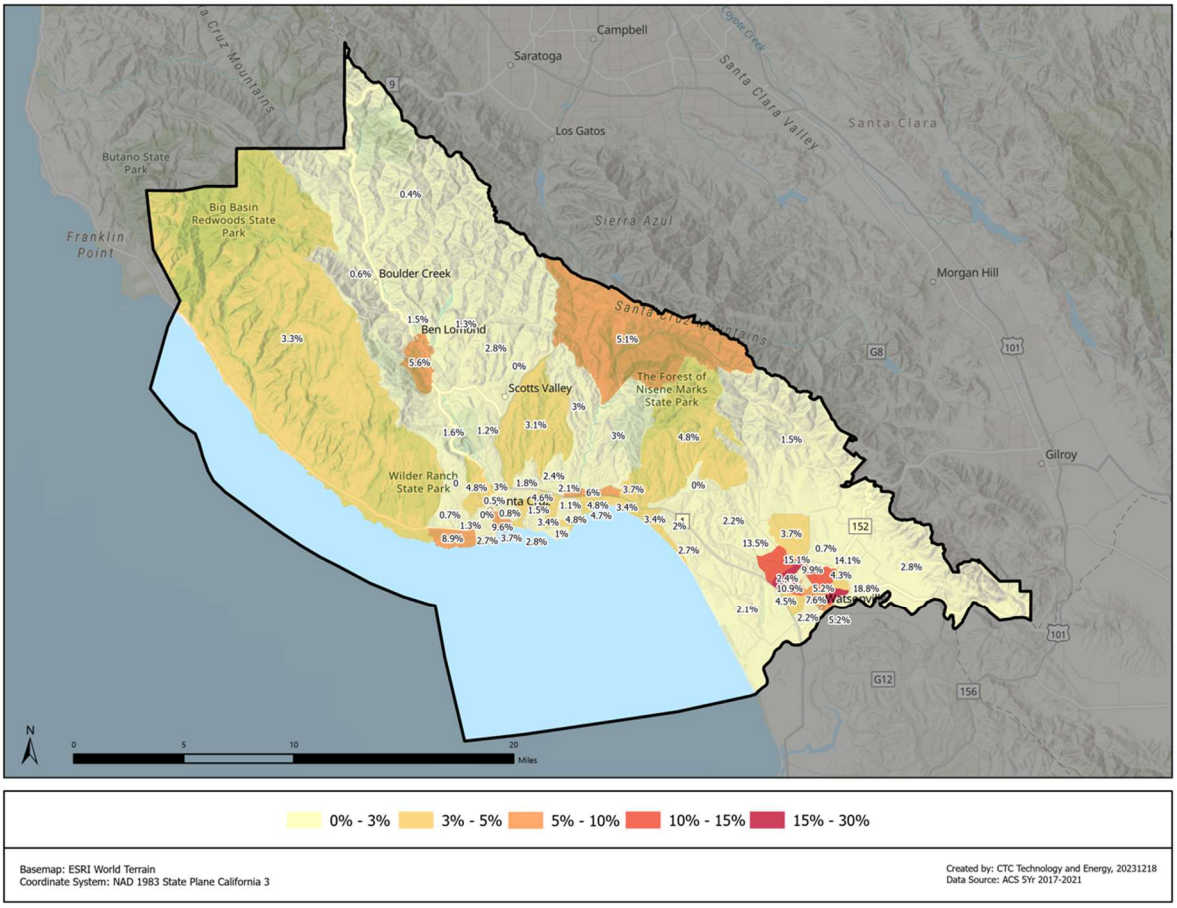
Figure 13: Percentage of the population with income below the poverty level



2.5.2 Computer ownership in the County dips in lower-income regions

Areas with a higher percentage of households without a computer, tablet, or smartphone are concentrated around the City of Santa Cruz, Live Oak, Freedom and Watsonville, generally in areas where there are also higher percentages of households lacking an internet subscription as shown in Figure 14. When comparing poverty levels (Figure 13) with computer ownership rates (Figure 14), it is clear that low-income households tend to lack computers and other internet-enabled devices.

Figure 14: Percentage of the population without a computer, smartphone, or tablet



2.5.3 ACP participation analysis indicates 28 percent of eligible households are enrolled in the County

The ACP, which until February 7, 2024 provides a monthly subsidy for home internet subscriptions, presented an opportunity for many low-income residents to purchase a quality broadband subscription and device more affordably.

As of January 15, 2024, the FCC reports that 11,441 households in Santa Cruz County are receiving internet services paid for by the ACP.[21] An estimated 40,454 households in the County may be eligible.[22] Therefore, 28 percent of eligible households in Santa Cruz County are currently enrolled in the ACP. This enrollment rate is higher than most neighboring counties, but it lags

[21] "ACP Enrollment and Claims Tracker," USAC, https://www.usac.org/about/affordable-connectivity-program/acp-enrollment-and-claims-tracker/.

[22] Estimates are based on 2022 American Community Survey reported data on household income, food stamp recipiency, Medicaid recipiency, supplemental security income, and public assistance income. It is important to note that this estimation does not take into account all qualification mechanisms, such as qualification via tribal assistance programs, and therefore may represent an underestimate of the size of eligible populations throughout the state.

behind the statewide figure of 49 percent. The enrollment rate in the Watsonville area is currently 69 percent.

Table 2: ACP enrollment in Santa Cruz County and neighboring counties[23]

County/State	Eligible households enrolled	Eligible households	Enrolled households
Alameda	31%	209,926	64,989
Santa Cruz	**28%**	**40,454**	**11,411**
Santa Clara	27%	204,684	55,828
Monterey	31%	61,142	18,851
San Benito	34%	7,723	2,634
San Mateo	17%	75,900	13,079
Butte	31%	46,119	14,218
Marin	16%	28,904	4,592
San Luis Obispo	31%	42,132	13,129
San Joaquin	39%	120,249	46,834
Sonoma	19%	71,600	13,660
Yolo	25%	34,653	8.744
California	49%	5,844,797	2,834,728

2.6 AT&T, Comcast and Charter all offer low-cost programs that are free with ACP enrollment

Pricing research was conducted for the four major residential ISPs in Santa Cruz County in February 2023. The following providers' pricing plans were reviewed.

- **AT&T** provides fiber and DSL broadband services.
- **Charter** provides cable broadband services.
- **Comcast** provides cable broadband services.
- **Cruzio Internet** provides fiber and fixed wireless broadband services.

2.6.1 Fiber service pricing

AT&T is the primary fiber broadband service provider in Santa Cruz County and offers five speed tiers for its residential service offerings. Internet 300 and Internet 500 services offer speeds of 300/300 Mbps and 500/500 Mbps and cost $60 and $70 per month respectively. The highest speed tier is 5 Gbps symmetrical at $185 per month.

[23] As of January 15, 2024; Affordable Connectivity Program enrollment tracker https://broadbandforall.cdt.ca.gov/affordable-connectivity-program/acp-enrollment/#

AT&T also offers an eligibility-based low-cost program, AT&T Access, which makes symmetrical 100 Mbps service available for $30 per month where available.[24] For households that only have access to DSL services from AT&T (as opposed to fiber), lower speed tiers are available for $5 to $10 per month.

Households are eligible for AT&T's Access program if they participate in the Supplemental Nutrition Assistance Program (SNAP), National School Lunch, Supplemental Security Income (SSI), or if their household income is below 200 percent of the federal poverty line. Additionally, households that enroll with AT&T via the ACP are also eligible and may qualify for free internet access.[25] Households must not have accrued any debt to AT&T within the last six months to be able to apply.[26] Table 3 summarizes the services and prices offered by AT&T.

Table 3: AT&T residential fiber pricing

Name of plan	Speed	Monthly non-promotional price	Minimum contract	Additional information
AT&T Access	100/100 Mbps	$30	No contract	Only available for qualifying households
Internet 300	300/300 Mbps	$60	No contract	Up to $99 for installation
Internet 500	500/500 Mbps	$70	No contract	Up to $99 for installation
Internet 1000	940/880 Mbps	$85	No contract	No installation fees
Internet 2000	2/5 GB	$115	No contract	No installation fees
Internet 5000	5/5 GB	$185	No contract	No installation fees

Cruzio Internet also offers FTTP services in downtown Santa Cruz, although most of its service footprint is covered by fixed wireless. Cruzio claims to serve approximately 10,000 customers, 80 percent of which are served with fixed wireless and 20 percent of which are subscribed to fiber services.

Through the development of its fiber broadband footprint in the City of Santa Cruz, Cruzio offers a broadband subscription called Wireless Pro at $74.95 per month. Depending on the

[24] "Access from AT&T," AT&T, https://www.att.com/internet/access/ (accessed February 24, 2023)
[25] "Access from AT&T," AT&T, https://www.att.com/internet/access/ (accessed February 24, 2023).
[26] "The Access program from AT&T," AT&T, https://www.att.com/support/article/u-verse-high-speed-internet/KM1094463/ (accessed March 6, 2023).

infrastructure serving the subscriber's location, Cruzio connects the household to its fiber backbone through wired or wireless technology.[27]

Based on its current infrastructure, Cruzio reports that it has the ability to provide gigabit service to only a portion of the City of Santa Cruz but is expanding aggressively to provide coverage to the majority of the City. Its fiber broadband service for businesses, Enterprise Broadband, is priced at $499 per month for speeds up to 1 Gbps.

Table 4: Cruzio fiber pricing

Name of plan	Speed	Monthly non-promotional price	Minimum contract	Additional information
Wireless Pro*	100/100 Mbps	$74.95	No contract	Monthly router rental cost: $9.95
Enterprise Broadband	Up to 1 Gbps	$499	No contract	-

* Wireless Pro is a hybrid fiber-wireless connection

Though Charter has a small fiber footprint in the County, it only serves businesses with fiber. The same is true for Digital West, NetFortis, and Vast Networks.

2.6.2 Cable service pricing

Comcast and Charter are the primary cable broadband providers in the County. Table 5 summarizes the pricing for cable services provided by Comcast. Comcast offers download speeds up to 1.2 Gbps, but as is typical of cable broadband services, the fastest upload speed offered is 35 Mbps.

Since 2011, Comcast has offered its Internet Essentials plan for eligible low-income customers.[28] Currently, these customers pay $9.95 per month for a wired internet connection at up to 50/10 Mbps using the Comcast legacy cable network. The company also has an "Internet Essentials Plus" service at 100/20 for $29.95, available where Comcast has upgraded its infrastructure to reliably offer service at that speed. Qualifying customers also have the option to purchase a refurbished computer for $149.99. Additionally, customers that qualify for the ACP can stack their discounts and receive 50/10 Mbps or 100/20 Mbps service to their home for free.[29]

[27] "Wireless pro," Cruzio Internet, September 1, 2020, https://cruzio.com/services/broadband/wireless-pro/ (accessed February 20, 2023).
[28] Internet Essentials, Xfinity, https://www.internetessentials.com/ (accessed February 20, 2023).
[29] "Free Internet with the Affordable Connectivity Program (ACP)," Xfinity, https://www.xfinity.com/learn/internet-service/acp/free-internet (accessed February 20, 2023).

Internet Essentials has several eligibility criteria that also match the ACP.[30] Standard eligibility rules for the Internet Essentials program require that potential customers must not have received service from Comcast within the past 90 days and must not have debt to the company that is less than one year old. However, Comcast has waived selected eligibility rules in the past and customers should be encouraged to inquire about current rules and promotions with ACP and Internet Essentials.[31]

Table 5: Comcast cable pricing

Name of plan	Speed	Monthly non-promotional price	Minimum contract	Additional information
Internet Essentials	50/10 Mbps	$9.95	No contract	No activation fees or equipment rental fees, and wireless gateway at no extra cost. Option to buy a computer for $149.99 before tax. Only available to qualifying households.
Internet Essentials Plus	100/20 Mbps	$29.95	No contract	
Connect	75/10 Mbps	$61	1-year contract	Modem and router for $15/month. Self-installation at no cost.
Connect More	200/10 Mbps	$73	No contract	Free modem and router. Self-installation at no cost.
Fast	400/10 Mbps	$83	No contract	
Superfast	800/35 Mbps	$93	No contract	
Gigabit	1 Gbps /35 Mbps	$103	No contract	
Gigabit extra	1.2 Gbps/35 Mbps	$113	No contract	

Charter has a smaller footprint than Comcast and covers certain areas in the southern part of the County. It offers 300 Mbps, 500 Mbps, and close to 1 Gbps symmetrical service for non-promotional prices of $79.99, $99.99, and $119.99 per month, respectively. Charter also has an income-qualified discount program called Spectrum Internet Assist that is similar to AT&T's Access program and Comcast's Internet Essentials. This program offers no-cost services at 30

[30] "Internet Essentials: Get Help," Xfinity, https://www.internetessentials.com/get-help#application&Documentsneeded (accessed February 20, 2023).
[31] "Internet Essentials: Frequently asked questions," Xfinity, https://www.xfinity.com/learn/internet-service/internet-essentials (accessed February 20, 2023).

Mbps download speeds for those who also participate in ACP, and it is only available to new internet subscribers.[32]

Table 6: Charter cable pricing

Name of plan	Speed	Monthly non-promotional price	Minimum contract	Additional information
Internet Assist	30/4 Mbps	$19.99	No contract	Includes modem and Wi-Fi router. Wi-Fi extender for $5/month. Only available to qualifying households.
Internet	300/10 Mbps	$79.99	No contract	Free internet modem, no data caps, free unlimited access to nationwide out-of-home Wi-Fi, free antivirus software. Wi-Fi extender for $5/month.
Internet Ultra	500/ 20 Mbps	$99.99	No contract	
Internet Gig	940/35 Mbps	$119.99	No contract	

2.6.3 Fixed wireless pricing

In addition to Cruzio's fiber offering, Cruzio is the primary fixed wireless provider in the County, offering Cruzio Wireless Internet subscription speeds of 25/5 Mbps, 50/25 Mbps, and 100/50 Mbps at $74.95, $124.95, and $149.95, respectively. Cruzio also offers a hybrid fiber-wireless connection, Wireless Pro, that has 100 Mbps symmetrical speeds for $74.95 per month. Professional installation costs $149, and the price of a monthly router rental is $9.95 for all plans. There are no contracts required.

Cruzio has partnered with several community organizations, the County Office of Education, and schools to provide discounted internet services to qualifying residents. Service is discounted to $14.95 per month with Wi-Fi and hardware included. If the household also qualifies for the federal ACP program, service could be free.[33]

[32] "Spectrum Internet Assist," Spectrum, https://www.spectrum.net/support/account-and-billing/spectrum-internet-assist (accessed March 6, 2023); see also https://www.spectrum.com/internet/spectrum-internet-assist.
[33] Information about Cruzio's Equal Access Santa Cruz service can be found here: https://cruzio.com/services/broadband/easc-suf/; see also, the accomplishments of Equal Access, https://cruzio.com/2023/09/an-update-on-equal-access-santa-cruz/ and information about Cruzio's ACP participation, https://cruzio.com/2022/11/acp/.

Table 7: Cruzio fixed wireless pricing

Name of plan	Speed	Monthly non-promotional price	Minimum contract	Additional information
Cruzio Wireless Internet	25/5 Mbps	$74.95	No contract	Monthly router rental cost of $9.95 and installation fee of $149
Cruzio Wireless Internet	50/25 Mbps	$124.95	No contract	
Cruzio Wireless Internet	100/50 Mbps	$149.95	No contract	
Wireless Pro*	100/100 Mbps	$74.95	No contract	

* Wireless Pro is a hybrid fiber-wireless connection

Surfnet's coverage area is focused in the northern part of the County near the Summit and throughout the Santa Cruz Mountains as shown in Table 8. The company offers three internet plans: Basic for $69.95 at speeds of 10/3 Mbps, Advanced for $99.95 at 15/4 Mbps, and Premium for $149.95 at 50/10 Mbps. One-time costs for equipment and installation are $225 and $125, respectively, for all plans.

Table 8: Surfnet fixed wireless pricing[34]

Name of plan	Speed	Monthly non-promotional price	Minimum contract	Additional information
Basic	10/3 Mbps	$69.95	No contract	$225 for equipment, $125 installation costs
Advanced	15/4 Mbps	$99.95	No contract	$225 for equipment, $125 installation costs
Premium	50/10 Mbps	$149.95	No contract	$225 for equipment, $125 installation costs

T-Mobile offers two residential internet services called the Home Internet Plan and Home Internet Lite and accepts ACP. The Home Internet Plan is $55, with speeds that vary between 33 to 182 Mbps download speeds, and 6 to 23 Mbps upload speeds.[35] The Home Internet Lite plan offers the same speeds but with a choice of four data caps and higher pricing overall because the Lite plan is designated for areas of T-Mobile's network with comparatively less capacity.[36] Home Internet Lite customers may also experience lower speeds during times of network congestion "due to data prioritization."[37] Table 9 shows the plans offered by T-Mobile; these plans are not available to all addresses.

[34] Surfnet reports that it participates in the federal ACP program to provide qualifying residential end users discounts of up to $30, but there is no information about these discounts available on the Surfnet website.

[35] "Frequently Asked Questions," T-Mobile, https://www.t-mobile.com/home-internet/faq (accessed March 20, 2023).

[36] Eli Blumenthal, "T-Mobile Makes its Home Internet Open to Everyone, but With Data Limit Catch," CNET, August 9, 2022, https://www.cnet.com/home/internet/t-mobile-makes-its-home-internet-open-to-everyone-but-with-data-limit-catch/.

[37] "T-Mobile Home Internet Lite," T-Mobile, https://www.t-mobile.com/support/home-internet/t-mobile-home-internet-lite (accessed March 20, 2023).

Table 9: T-Mobile fixed wireless pricing

Name of plan	Speed	Monthly non-promotional price	Additional information
Home Internet Plan	Typically between 3-182 Mbps download/ 6-23 Mbps upload	$55	No contract, unlimited data, no caps, no overage penalties. No equipment fees, installation fees, activation fees or termination fees. Regulatory fees included in monthly price for qualified accounts.
Home Internet Lite (100 GB data cap)	Typically between 3-182 Mbps download/ 6-23 Mbps upload	$55	Limited to 100 GB of data usage per month at regular speeds, reduced service speeds after limit reached. No contract, overage penalties, equipment fees, installation fees activation fees, or termination fees.
Home Internet Lite (150 GB data cap)	Typically between 3-182 Mbps download/ 6-23 Mbps upload	$80	Limited to 150 GB of data usage per month at regular speeds, reduced service speeds after limit reached. No contract, overage penalties, equipment fees, installation fees activation fees, or termination fees.
Home Internet Lite (200 GB data cap)	Typically between 3-182 Mbps download/ 6-23 Mbps upload	$105	Limited to 200 GB of data usage per month at regular speeds, reduced service speeds after limit reached. No contract, overage penalties, equipment fees, installation fees activation fees, or termination fees.
Home Internet Lite	Typically between 33-182 Mbps download/ 6-23 Mbps upload	$150	Limited to 300 GB of data usage per month at regular speeds, reduced service speeds after limit reached. No contract, overage penalties, equipment fees, installation fees activation fees, or termination fees.

3 The project team met with a variety of stakeholders to gather information on broadband access and deployment in the County

The research from publicly available sources and the residential survey was supplemented by discussions with ISPs, local government leaders, K-12 and higher education institutions and businesses. This section provides a summary of the high-level findings from stakeholder meetings. A full account of stakeholder feedback is included in Appendix B.

3.1 ISPs

The ISPs that participated in these meetings included:

- AT&T
- Charter
- Cruzio
- Comcast
- Surfnet
- Verizon
- T-Mobile

The service territory of each ISP is further described and mapped in Section 2 of this report. Summaries of the insights provided by each ISP are included below.

3.1.1 AT&T

AT&T has a large presence in Santa Cruz County, and is the primary fiber provider in the County. Fiber facilities are deployed primarily in urban and more dense suburban areas. AT&T is still providing legacy DSL services to existing customers but is not offering it to new customers. The biggest barrier to building fiber into new areas is the high cost to build. Hilly terrain with certain sparsely populated areas often makes it technically difficult and financially infeasible to lay fiber in places like San Lorenzo Valley and Bonny Doon.

Although AT&T representatives stated that the County permitting office was not an impediment or bottleneck for previous projects, wireless permitting improvements could help to bring coverage and connectivity to new areas.

3.1.2 Comcast (Xfinity)

Comcast has a very large coverage area in the County with its Xfinity service – in all parts of the County except the northwest and the southeast. The company plans to upgrade its equipment to DOCSIS 4.0 by 2025, providing symmetrical gigabit speeds. It has no current plans for expansion in the County; however, representatives identified that the region north of Davenport and Aptos Hills are areas that may need stronger service. Comcast's main challenges for building fiber in Santa Cruz County are the varied terrain in the north of the County and the additional costs for resiliency planning for major weather events in California.

Comcast representatives discussed the issue of overloaded poles in the County. Deployment in these areas often requires underground construction, which is costly and requires additional permitting. Representatives also stated that permits require a wait of a year or more.

3.1.3 Charter Communications

Charter service areas are primarily in the southern part of the County and include both cities and rural areas. Charter provides a hybrid fiber-coax network for residential service in these areas, with fiber to the node and coax to the premise. Charter uses mostly aerial infrastructure, which at times can be a challenge, as Santa Cruz County poles are overloaded and permits have extended processing times.

Charter stated it has rural deployment currently underway across the County; however, because wireline infrastructure can be costly, the company is actively seeking partnerships with jurisdictions to apply for grants to finance expansion efforts.

3.1.4 Cruzio Internet

Cruzio Internet is an independent ISP that has been in business in Santa Cruz County for over 30 years. It has an extensive fixed wireless network and has built out fiber to the premises in the City of Santa Cruz and the City of Watsonville. Its fiber is built with the goal of a fully redundant network with three different paths to ensure resiliency in the face of local challenges such as weather-related disasters. Cruzio is expanding aggressively to provide fiber gigabit service to other parts of the City, leveraging the Crown Castle middle-mile infrastructure as its primary backhaul path.

Cruzio stated that the barriers it has faced to expand in the County include lack of funding, pole availability, degradation of poles over time, and power generation. The company is enthusiastic about a new fixed wireless technology, Tarana Wireless, that should enable reliable connectivity in areas that were considered infeasible based on previously available technology.

Cruzio also discussed its Equal Access program that started at the beginning of the pandemic. The company has raised nearly $1 million for projects to cover both infrastructure and discounted services. The Equal Access project provides connectivity to students and their families who may not be able to afford internet service. Completed projects are located in the City of Santa Cruz, Live Oak and Pajaro Valley. This project is a partnership between Cruzio, County Office of Education, and Community Foundation Santa Cruz County, as well as the Housing Authority of the County, and the Central Coast Broadband Consortium. Cruzio is interested in continuing to fund this program with outside funding.

3.1.5 Surfnet

Surfnet is another independent ISP that has been in business since 2002. It primarily serves regions in the northern part of the County. Its mission is to connect unserved areas that are high

cost and have challenging topography. It is mainly a fixed wireless provider with some small fiber builds, almost all of which is aerial fiber. It primarily owns its own facilities but does lease some space on commercial towers. Surfnet has approximately 2,000 residential customers in the County, and provides service to various non-residential customers including schools, public safety, small businesses, HOAs and community centers.

Surfnet has received a grant to extend its fiber in Loma Prieta in the north part of the County to provide service to a preschool and public school in the area. It is also working to extend this fiber to the regional Sheriff's office as a second phase of this effort.

Surfnet applied for the NTIA Middle Mile Grant, which was primarily a wireless middle mile proposal.[38] This application was submitted in collaboration with several other ISPs in the area and took the CPUC's middle mile project into consideration when building the proposal, so that local facilities could be connected to state infrastructure once constructed.

Surfnet stated its desire for the County to act as a facilitating partner to apply for state and federal funding with all carriers in the area, and to help providers identify priority areas for future projects. While Surfnet did not disclose any plans to build in new areas of the county, it is looking to upgrade its current last mile facilities near Hutchison Road and the Summit and would like to upgrade and weather-proof its own facilities in Bonny Doon after recent storms and fires.

3.1.6 Verizon

Verizon representatives stated that the company has no wireline facilities in the County after its merger with Frontier and has very little fixed wireless coverage except for small areas in the City of Santa Cruz's downtown region. It leases backhaul and middle-mile capacity from other service providers in the County and does not have its own middle mile facilities.

Verizon stated that it has solid mobile network coverage across the entire county; however, due to challenges experienced when building towers in the more populated areas, it has been unable to equip them with newest technology to support the most efficient allocation of user traffic and spectrum management. Verizon acknowledged it will need to deploy additional backhaul capacity to accommodate the increased demand for service from the high-density and rural areas within the county. Verizon also made a point that the County has not been a barrier to permitting or build-out plans and has come out in support of some wireless tower projects because the projects will help the County increase its own capacity.

[38] After this discussion, NTIA announced the grantees for this program on June 15, 2023. Surfnet's coalition did not receive an NTIA Middle Mile grant. To view recipients, visit https://broadbandusa.ntia.doc.gov/funding-programs/enabling-middle-mile-broadband-infrastructure-program/funding-recipients.

Barriers that prevent Verizon from expanding to new areas of the County include varied terrain, lack of density, and community resistance to projects. Verizon provided an example regarding the recent placements of two towers; due, at least in part, to community protests, the tower siting took five years to complete.

Verizon representatives did not comment on any potential buildouts in the County and could not speak to any potential interest by the Company in federal or state funding. Verizon hopes the County can provide continued support for tower siting and applications for funding. Verizon also is interested in the County developing a list of County-based assets for providers to understand where equipment can be placed and strategize locations for future infrastructure build outs.

3.1.7 T-Mobile

T-Mobile has a limited presence in Santa Cruz County for fixed wireless services, with pockets of coverage in Ben Lomond, Scotts Valley, Freedom, and the southeastern corner of the City of Santa Cruz. It does not provide wireline service.

The company has been supporting the Pajaro Valley and Santa Cruz school districts with hotspot programs. T-Mobile participates in the ACP program, but only for cellular services. It sponsors ACP sign-up events throughout the state of California.

Representatives stated that T-Mobile would be interested in future fixed wireless buildouts in areas that are difficult to reach via wireline technology.

3.2 Governments

County staff met with the Supervisors for each district to gather information about broadband needs and efforts. Stakeholder meetings included officials of all the incorporated city governments in the County.

3.2.1 Board of Supervisors feedback

The County met with each of the Supervisors in the five districts as well as their staff, and they discussed funding opportunities, maps and needs of the residents in each district. Supervisors articulated the following concerns.

3.2.1.1 Coverage

Many of the supervisors remarked on the troublesome topography of the County, with hills, mountains and dense foliage creating problems for broadband infrastructure buildouts. They also questioned the accuracy of coverage as depicted in the CPUC and FCC maps. They remarked that many residents can subscribe to only a single provider. They also expressed interest in emerging technologies that can potentially fill the gaps in the County.

They were particularly concerned about coverage in emergency situations due to the many natural disasters that have occurred in the County over the past few years. First responder

communications in evacuations have been previously hampered. Also critical is the need to communicate with residents in a crisis. In the past, downtimes in connectivity during an emergency prevented the County from giving updates to residents about changing conditions and evacuation orders.

3.2.1.2 Reliability and affordability

Constituents have also complained to the Supervisors about downtimes in rural and mountainous areas. This severely affects residents' ability to telecommute or participate in distance learning, as seen during the COVID-19 crisis. They also expressed that some constituents are unable to afford the service plans available to them.

3.2.1.3 Impediments to building infrastructure

Supervisors also cited problems with connecting areas such as mobile home parks due to the owners' lack of cooperation or assistance with installation of equipment. They felt that the State and federal funding will not fully fill all the broadband gaps, and that additional investment is needed. The state middle-mile network may be an opportunity for infrastructure expansion in the future. Permitting issues for both fiber and fixed wireless deployments have led to lengthy delays in the County in the past. Supervisors also called for more holistic planning for deployment and felt that many existing efforts were siloed. Leveraging community partnerships could enable this type of higher-level planning.

In District 1, areas of concern include:

- Between Emerald Bay and Soquel Village
- Glen Canyon / Granite Creek Road
- Along Old San Jose Road corridor
- Soquel Village Business Park
- Along Summit Road (including the need for a wireless POP on Loma Prieta School)
- Shangri-La Estates Mobile Homes
- Capitola corridors – 38th and 41st Avenues
- Mobile homes and trailer parks

In District 2, areas such as Day Valley, Trout Gulch and Corralitos are of most concern.

The priority areas for coverage in District 3 include Bonny Doon, Whitehouse Canyon Road, Last Chance Road and the Town of Davenport. The areas that have issues with affordability include Beach Flats, West Side, and downtown. There also are affordability issues with the DeAnza and Clearview mobile home parks.

Specific areas that need better connectivity in District 4 include:

- Mesa Village Park

- Pinto Lake
- Casserly Road
- Hwy 129 towards Mount Madonna
- Hwy 152

In District 5, Boulder Creek and San Lorenzo Valley are the biggest areas of concern. As mentioned above, there are isolated areas in the mountains with many seniors who need to be connected to receive communications about emergency situations.

3.2.2 City of Watsonville

CTC and the County met with Brandon Gill, Director of IT for the City of Watsonville. The City of Watsonville is primarily an agricultural community in the southern part of Santa Cruz County. The biggest businesses located in the area are Martinelli's, which produces apple juice and cider, and a large FedEx distribution facility. These companies have not expressed dissatisfaction with broadband access to the City. Demand for broadband also comes from the Pajaro Valley Water District and new affordable housing developments. The County will have new facilities in Watsonville that will increase demand.

One of the biggest issues for the City is aging infrastructure. For example, it replaces a mile of water main per year due to the state of the pipes. Another issue is lack of cellular coverage in certain areas. Brandon Gill also noted another barrier – that residents often use cash only and some lack citizen status, making it hard for them to subscribe to services or programs.

The City of Watsonville has its own dark fiber network that it developed in conjunction with Cruzio. The City has two 1 GB circuits but is moving toward a 10 GB connection over the next five years. Cruzio is planning to upgrade the City's facilities in the area and increase capacity to 40 GB and 100 GB. Watsonville also offers middle-mile access services on its fiber.

Watsonville also developed a broadband plan for the upcoming budget cycle, which was published in the beginning of the fiscal year 2023-24. The City noted the need for increased coverage to support telehealth for Watsonville Community Hospital, but was not familiar enough to provide details during the meeting. It is also working on a dig-once policy and will be requiring geolocation information for the deployed conduit to develop better record keeping. It is also working on a small cell antenna ordinance.

The City of Watsonville would like to leverage the County's relationships and develop informal coalitions to enlist additional project partners. It also would like to have the County act as an advocate at the state level with the legislature and state agencies like the CPUC. It urges the County to consider a bulk purchasing structure to help cities under a single contract where there may be discounts for services and a wider variety of vendors to create competition. It is also looking to the County for other partnership, colocation, and service agreements that could

include placing equipment on additional County and City facilities to mutually support each other's expanded network capacity.

3.2.3 City of Santa Cruz

The County and CTC met with Laura Schmidt, the Assistant City Manager of the City of Santa Cruz. The City has not been deeply involved in broadband infrastructure deployment for the area, nor has it received much feedback from the community about access and adoption. According to the Assistant City Manager, community members generally go directly to the ISPs for information about broadband coverage. The main areas of need are Beach Flats, which is likely an affordability issue rather than a coverage issue, and some mobile home parks.

The City itself uses both Cruzio and Comcast for its operations, both fiber and cable. The City has not completed any broadband planning to date, as it has had relatively comprehensive coverage from multiple ISPs. There is existing "old" dark fiber from cable franchise days, but it is not clear how it is being used now.

3.2.4 City of Capitola

Participants in the stakeholder meeting for the City of Capitola included Chloe Woodmansee, the Assistant City Manager, and Heather Haggerty, the IS Specialist. Capitola is just two square miles and is located along the coast south of the City of Santa Cruz.

City officials claimed that their internet needs were generally met, for both government and residents. The City government uses fiber by both AT&T and Charter Spectrum; it has not experienced downtime or speed issues that were notable. The City has not heard from residents with complaints about inadequate access to broadband. The State of California Middle-Mile Broadband Initiative has a planned project right through the City.

Though City officials said that broadband access has not been a problem in general for residents, there is a concern about affordability of service. Residents of mobile home parks and low-income housing and seniors have the most significant challenges and may not be able to afford internet service that meets their needs.

3.2.5 City of Scotts Valley

CTC and the County met with the Police Chief of the City of Scotts Valley and gathered data from the City's IT consultant and Community Development Director. The City requires broadband access sufficient to work with hosted services such as Office 365 and Microsoft Teams and capability to support 24/7 public safety software systems and infrastructure. The City uses both AT&T fiber as well as Comcast services, but would like to have additional fiber services for enhanced reliability. The City is continuing to increase its usage of cloud services in the form of SaaS applications and business continuity, and therefore reliable and redundant connections are necessary. The City requires reliable vendor redundancy and synchronous data speeds up to 1

Gbps. There are redundant fiber ISP connections, and the available capacity will be sufficient for the next 5 years.

The City has not completed any analysis and planning of broadband needs for the residents of Scotts Valley. It has been involved in supplying free and reserved Wi-Fi connectivity at SkyPark.

Service reliability is an issue for residential customers. Comcast is the only ISP that provides 100 Mbps speeds to most areas of the City. Comcast has regular outages under the best circumstances, and it goes out more often and for longer time periods when there are weather events. The City staff stated that AT&T claims to have high-speed access, but its residential service often offers less than 50 Mbps download. They mentioned that both AT&T and Comcast suffer from capacity issues, and service is inconsistent.

City officials said that the County needs to work in partnership with the individual cities, who will determine how buildouts will occur and how they will be supported. Officials also felt that the County should require the ISPs to send over data that defines what areas of the County they serve, to include internet speeds, and price points.

3.3 Higher education

Representatives from the University of California Santa Cruz (UCSC) and Cabrillo College (Cabrillo), the two primary higher education institutions in the County, participated in a joint interview. A representative from Digital Nest also joined the conversation.

UCSC's main campus is in the north part of the County, with satellite locations in the lower West Side of town and another campus in Monterey County. Cabrillo's main campus is located in Aptos, with a satellite campus in downtown Watsonville.

UCSC has nearly 20,000 students, most of whom are on the main campus. The UC system would like to increase the student population by an additional 10,000 students in the next 10 years. Cabrillo currently has just under 10,000, 33 percent of whom are full-time. Since the pandemic, both UCSC and Cabrillo also deal with a large portion of remote workers.

3.3.1 Challenges

Both institutions are concerned about sufficient bandwidth to support growth. They rely on the CENIC network, which connects education and research institutions to each other throughout the state. Cabrillo is concerned that the CENIC network is built upon AT&T's aging infrastructure, causing even AT&T fiber to be unreliable and making upgrades very slow.

Cabrillo believes it is well served and has redundant links for both the Aptos and Watsonville campuses. Cabrillo IT is also exploring the possibility of alternative fiber through Charter Spectrum. Currently Cabrillo purchases services directly with AT&T and also purchases services

under a different contract between CENIC and AT&T. Because CENIC is also working with Charter, Cabrillo may work more with Charter for future services. It has also been a challenge to accommodate a significant number of remote workers.

UCSC claims its current network is at approximately 70 percent capacity. The campus and its surrounding area are well served. UCSC currently has two 100 GB circuits and is considering adding another through CENIC. The university is looking for physical redundancy and diversity which the main campus has but not their locations in the mountains. It is working with Crown Castle to purchase other services to increase diverse routing and redundancy.

UCSC will need to increase in capacity to accommodate the planned growth of the student population in the coming years. With this increase in capacity it can continue, and perhaps increase, the space on its infrastructure that is leased to providers.

3.3.2 Opportunities

Cabrillo recently received an NTIA Connecting Minority Communities (CMC) grant of $3 million for two to three years. The CMC grant will fund devices and connectivity for 140 underserved students, including an assessment of home access. It may consider using Starlink for services. Most of the students participating in the CMC program are located in South County. Cabrillo hopes to apply the learnings from this grant program to continue its work to serve students in need. Cabrillo also discussed relationships with K-12 partners and UCSC services to achieve student success.

UCSC discussed the efforts by its student services and the Vice Chancellor for Student Success to provide affordable devices and services to students through kiosks on campus to give away laptops for use on campus and grants for discounted services and devices.

Both also mentioned efforts to migrate information housed in their data centers to the cloud and will rely on CENIC to upgrade the network to enable them to make this transition.

Both Cabrillo and UCSC expressed interest in partnering with the County and stated that previous efforts were hampered by a lack of resources. Partnership efforts could include outreach efforts, remote staff support, engineering, and grant writing.

3.4 K-12 education and libraries

CTC and the County met with the Santa Cruz County Office of Education and Santa Cruz Public Libraries.

The Santa Cruz County Office of Education (COE) serves approximately 36,000 students through its multiple school districts. The COE uses the CENIC backbone with two dedicated 10 GB pipes and each district has point-to-point fiber line back to the COE infrastructure. COE needs a

colocation facility for redundancy as its data center was threatened during the CZU Lightning Fires in 2020. Local independent ISP Cruzio has partnered with the COE and provides wireless capabilities at the individual school sites, including a wireless project that provides service into the surrounding neighborhood from equipment on a school property.[39]

Libraries have been offering hotspots for checkout and have participated in a Digital Navigator Program to help residents enroll in low-cost broadband programs. Navigators are assigned within 24 hours of a customer request, and in addition to finding discounted services, they also assist with finding resources for digital literacy skills and affordable devices.

There is a plan to create a new downtown library which will be completed in 2027. However, there will not be space in that location for a data center so it will move to its administration building. The library will add more backup power to the administration building to accommodate the data center.

3.4.1 Challenges

Broadband access and knowledge about affordable options is the biggest challenge for K-12 families. The COE has started collecting data on device ownership, internet access at home, hotspot usage, and service providers for students' families.

The biggest issue for the library system is outdated infrastructure that cannot support needed speeds and capacity, such as outdated wiring and equipment. The library system has gotten funding for updates.

The library also needs to keep branches open and in operation in case of emergencies. All the branches lost power in the recent 2023 winter storms and had insufficient back-up systems. It has taken several weeks to put them back in operation. Libraries also advocate for the fairgrounds to be equipped with the infrastructure to serve during emergencies.

As mentioned above, the servers will be moved to the administration building with a back-up generator. For communities impacted by disasters, the library is the main source of connectivity when it is not available in homes.

3.4.2 Opportunities

Both the COE and the library representatives agreed that the primary unserved or underserved areas of the County were in San Lorenzo Valley (including Boulder Creek, Felton and Ben Lomond), Scotts Valley, Davenport, Bear Creek Road, the Soquel and Aptos hills and the County

[39] "An Update on Equal Access Santa Cruz" (September 18, 2023) https://cruzio.com/2023/09/an-update-on-equal-access-santa-cruz/.

fairgrounds. Although Beach Flats is also an area of concern, the issue is more with affordability and digital literacy than with access.

The COE is participating in the Digital Divide Grant Program through the CPUC, which provides grants for student access to broadband at home, personal devices, and digital skills training. It is also participating in the School2Home Program sponsored by the Silicon Valley Education Foundation and the California Emerging Technology Fund (CETF). The libraries work with CENIC to qualify for E-Rate through the CA State Library grant program. This work with the State Library gives the library system discounts on services.

The COE is working with schools to deploy a satellite phone system as a form of backup and is working to expand FirstNet. Another opportunity for future buildouts for both these groups is the California Middle-Mile Broadband Initiative, which will be constructed along Highway 9, Highway 17, and Highway 1 up to Davenport.

3.5 Businesses and nonprofits

The County attempted to schedule a series of meetings with business leaders to gather feedback about internet access. There was only one meeting where invitees could attend. It was a small group and attendees included the director and manager of the Boulder Creek Business Association, the executive director of the Small Business Development Center (SBDC) of Santa Cruz and some small business owners including a realtor and an owner of a publishing business.

To be inclusive of as many business leaders as possible, data was also gathered through a brief survey that was distributed through the County, the chambers of commerce and other business organizations.

3.5.1 Stakeholder feedback

Since the attendees of the business stakeholder meeting were primarily located in the Boulder Creek-San Lorenzo Valley area, their focus was on the extreme needs in this area of the County. The CZU Lightning Fire in 2020 devastated the area and participants agreed that emergency communications were deficient due to poor cellular service and lack of internet access in many areas of the San Lorenzo Valley.

3.5.1.1 Challenges in San Lorenzo Valley

Participants noted that reliable internet access service requires a source of electricity and recounted the issues with electricity outages and delays to restore service during multiple emergencies. There was a mention of the state's regulatory requirements for larger ISPs to restore internet access within 72 hours even if the electricity is not yet restored, but the residents stated that their internet access providers did not follow those rules.

There is fiber on one block of downtown Boulder Creek installed by a very small provider called SLV Fiber, although members of the Business Association complained about ongoing outages and poor service quality throughout downtown. (Please note that SLV Fiber did not appear on the FCC maps.) One small business owner recounted her prior experience as an owner of a small inn located downtown that struggled to provide reliable service to her guests. She found that these experiences are not unusual, and this discourages tourism.

Comcast is available in the Boulder Creek area, but participants claimed that Comcast had difficulty reaching many locations due to closed roads and other construction. They complained that many locations did not get access to Comcast service and, even where Comcast may exist, the Comcast Wi-Fi service is unreliable. Residents were previously able to get AT&T DSL in Boulder Creek, but AT&T has discontinued this service and chose not to upgrade the copper lines to fiber in the area. Dead zones in cellular coverage prevent the ability to use hotspots in many instances. Participants all agreed that there is no cellular signal in many parts of Boulder Creek.

There was discussion that the Boulder Creek library has reliable internet service and provides access to local residents, but the library does not allow patrons to park and use the service when the library is closed.

Small business owners expressed that these problems exist in all the mountainous areas of the County, including Felton, Ben Lomond, Trout Gulch Road, and the Summit. They noted that these mountainous areas are increasingly difficult to serve and have experienced damage through many significant natural disasters over the past several years. There was agreement that businesses located in the City of Santa Cruz are generally well served and that robust and reliable internet access is crucial to the economic development and growth of small businesses throughout the County.

3.5.1.2 Middle mile opportunities

The State of California Middle-Mile Broadband Initiative plans to build fiber along Highway 9, which is the main thoroughfare through the San Lorenzo Valley. The buildout schedule has not been finalized but is anticipated to be completed by 2026. This fiber backbone will enable ISPs to provide last-mile service to residents and businesses of the unserved areas in the mountains. Participants noted that demand in this area will grow, especially with the expansion of Big Basin State Park and the expected influx of new visitors, making new middle mile and last mile facilities critical to meet this demand.

Cruzio has expressed interest in expanding its facilities in this area, including a planned fiber build in downtown Boulder Creek. SLV Fiber has already partnered with Cruzio to expand its service in this area and in other parts of the County.

Participants on the call agreed to distribute materials and surveys through their newsletters and distribution lists to support County efforts for broadband planning.

Upgraded and reliable internet service in San Lorenzo Valley will have significant benefits to this part of the County. Property values will increase, and real estate will be more desirable to buyers coming into the County. The realtor who participated in the business stakeholder meeting stated that reliable internet access could boost the price of a house by as much as $50,000. Upgrades would also enhance economic growth by encouraging the addition and retention of small businesses, including unique projects that will enhance the visitor experience and tourism but rely on reliable internet access. Access to remote learning and telecommuting would also be a great benefit, particularly for workers in Silicon Valley searching for homes in Santa Cruz County.

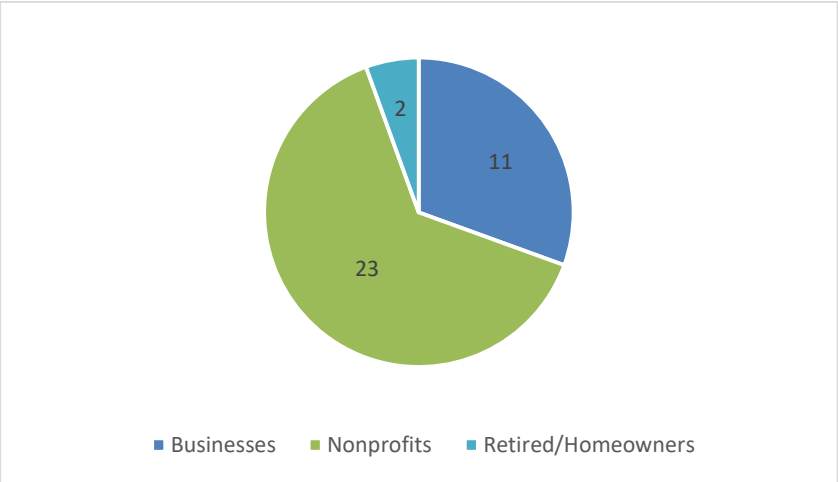
Participants urged the County to develop a forward-looking and proactive plan for broadband deployment and to stay engaged to support long-term implementation of the plan. They also suggested that the County serve as a coordinator among the different utility companies during emergencies and during non-emergency times to help manage construction projects and support undergrounding of utilities and "dig once" policies. County officials noted that the Public Works department meets regularly with utility companies to coordinate projects. Other participants urged the County to fund broadband projects that might otherwise be difficult for service providers to support with private investment, including consideration of a County-owned public utility with open-access to a county-owned facility. There was a brief discussion about the County's plans to monitor, influence, and participate where they can in upcoming federal funding programs.

3.5.2 Business and nonprofit survey

Business and nonprofit leaders received a survey from the County with the goal of understanding whether respondents believe they have access to broadband that meets the needs of their organizations and to identify what regions of the County have the most significant broadband connectivity challenges. The survey instrument is included in Appendix C.

In total, 36 individuals completed the survey: Of the respondents, 23 are nonprofits, 11 are businesses and 2 are homeowners in the County (see Figure 15). Only a few of the respondents represent organizations that provide services to specific communities or geographically defined areas. Most of these businesses and nonprofits provide services county-wide. Respondents represent a wide array of industries including technology, government, economic development, education, agriculture, sustainability, arts and entertainment, healthcare, natural wellness, retail, real estate, and senior services. The survey results are not statistically significant; however, the data offers additional insight into the needs of the County's business community.

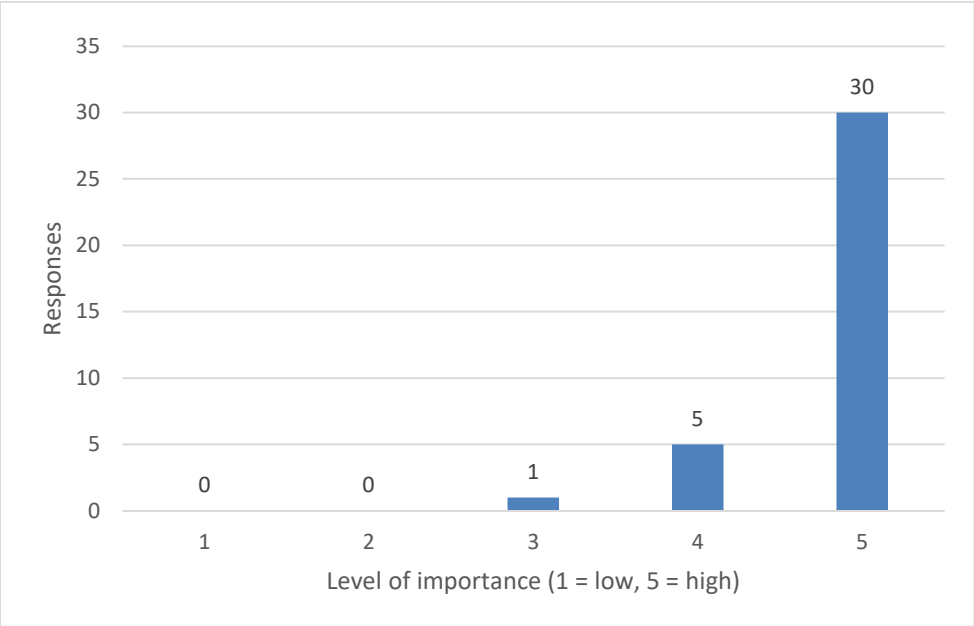
Figure 15: Breakdown of survey respondents



3.5.2.1 Importance of broadband and key areas for improvement

When asked the level of importance of broadband to their work using a 1 (low) to 5 (high) scale, 30 of the 36 respondents said broadband was critically important (see Figure 16 below). Many of these respondents explained that broadband is essential because of the need for bandwidth to run certain types of software, communication and virtual meetings, billing, and various other operational needs. They also mentioned the use of telehealth and access to electronic health records as a driver for demand of high-bandwidth broadband services. Five respondents rated the importance of broadband on their work as a 4; these individuals explained their broadband needs focus on online store operations, professional trainings, maintenance of electronic records, and information sharing. One respondent—a massage clinic in an unincorporated area—rated the importance of broadband to their work as 3, stating the primary use of internet for their practice is for web-based scheduling.

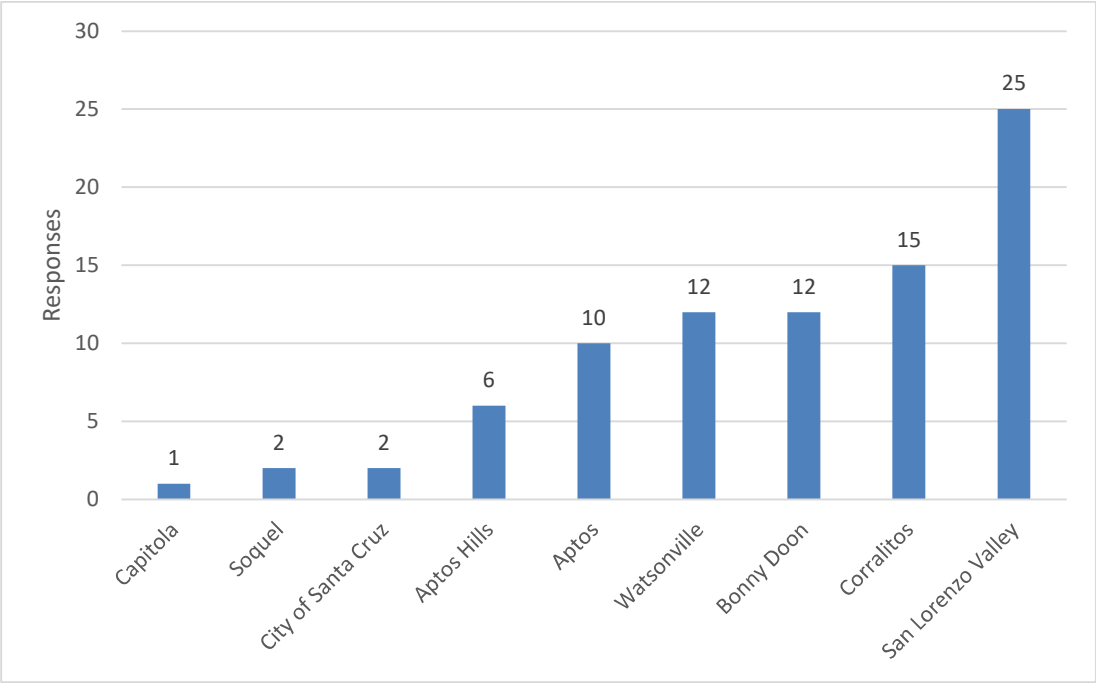
Figure 16: Importance of broadband to respondent's work



24 respondents claimed that they do not have affordable and reliable connectivity required to conduct their business and serve customers. Of those 24 respondents, 11 are currently subscribed to Comcast Xfinity, three are subscribed to AT&T, three are subscribed to Cruzio, one is subscribed to Charter, and the remaining are unsure of the service provider.

Respondents were asked to identify the areas in Santa Cruz County that they believe are most challenged for affordable and strong broadband connectivity (see Figure 17 below). They cited the San Lorenzo Valley and Bonny Doon in the north, and in Corralitos, Watsonville, Aptos and Aptos Hills in the south. Note that respondents could cite multiple areas.

Figure 17: Areas identified as having poor broadband connectivity



When asked what role the County should be taking in the expansion and build out of broadband access in the region, many stated they would like to see the County focus on facilitating ISP coverage into unincorporated or rural areas. This includes upgrading or building more towers and network access points for increased deployment. Additionally, many respondents articulated their hope that the County can incentivize more affordable service offerings by all ISPs, including community broadband options, so there is more consistency in subscription pricing and speeds county-wide.

4 A residential survey and speed test showed few broadband access gaps but issues with internet service

As part of its efforts to create a Broadband Master Plan, the County of Santa Cruz conducted a phone survey of households in April 2023. The survey was designed to gather basic data about residents' adoption of broadband services, the types of services to which they subscribe, and their use of these services. The intent was to establish a baseline of statistically valid data that can be updated on a periodic basis to measure progress in the County.

The County also sponsored a speed test on its website. The speed test webpage enabled residents to conduct a speed test of their connectivity, allowing the County to capture the serving ISP and general area of the County where the test was conducted. The webpage also included a brief survey that allowed users to note the type of device and overall customer experience. Results of the speed test are discussed in Section 4.4 below.

This report documents the survey process, discusses the methodology, and presents results to assist the County in developing strategies to provide internet service to residents.

Key findings are presented thematically in three subsections: broadband access gaps, device utilization gaps, and skills gaps in broadband and computer use. These and other findings are presented in greater detail in the body of the report.

4.1 Key findings

4.1.1 Broadband access gaps

The survey results showed few gaps in access to residential internet services, but some issues with quality of service. The following are key findings:

- **Almost all respondents have internet access.** 96 percent of households surveyed have internet service. One-half of home internet subscribers have Comcast/Xfinity service, 20 percent have Charter (Spectrum) internet, and 18 percent subscribe to AT&T.

- **Some internet subscribers have issues with their service.** One-half of home internet subscribers said their service is only moderately reliable or less. Furthermore, 65 percent of home internet subscribers experienced internet connectivity problems during severe weather events. Nearly one-half (48 percent) of respondents cited a need for cheaper service, and 43 percent said their service provider needs to provide faster service when asked the most important service aspect that needs improvement.

- **Most respondents purchase internet-only service.** 63 percent of subscribers pay $80 or more per month for unbundled service. 37 percent of households bundle internet service

with television or phone service. 42 percent of respondents reported that they pay $100 or more per month for internet service.

- **Residents may be underutilizing existing broadband subsidy programs.** Very few respondents who subscribe to internet services (one percent) are enrolled in a government or broadband provider discount or subsidy program. 87 percent said they are not enrolled in any program, and 11 percent were unsure.

4.1.2 Device utilization gaps

Most respondents have access to home internet service and computers, particularly among higher-income households. The following is a key finding:

- **Almost all respondents have access to computers and smartphones in the home.** 92 percent of all respondents report having at least one computer in the home. Most households earning $200,000 or more per year have at least three devices. Saturation of tablets is lower than saturation of computers and devices; however, three-fourths of high-income households have at least one.

4.1.3 Skills gaps in using the internet

Most respondents are skilled in various uses of the internet. However, a small segment of respondents reported significant challenges with respect to their ability to perform basic functions online. Key findings include:

- **Most respondents have the skills to perform basic tasks on the internet.** Overall, nearly all respondents are very confident in their internet and computer skills, such as using online consumer services (95 percent), accessing financial services (94 percent), sending and receiving emails (94 percent), and searching for a job online (94 percent). The only skill for which respondents demonstrated lower levels of confidence was operating a small home-based business (67 percent of respondents reported that they were very confident in this skill).
- **Certain at-risk households may be less skilled in using the internet for basic functions.** Those with a veteran in the household and those with an individual with a disability in the household said they or the primary user are less confident in their internet and computer skills. 53 percent of households who have an individual with a disability and 55 percent of households with a veteran, respectively, said they are very confident in operating a small home-based business. 66 percent of households who have an individual with a disability and 67 percent of households with a veteran, respectively, said they are very confident in working remotely.

4.2 Survey methodology

The project team conducted a statistically valid survey of residents from April 10-14, 2023. The survey captured information about their home internet service, service providers, the price they pay for service, their opinions on areas of improvement of service, enrollment in subsidy or discount programs, their device usage, and computer and internet skills. A copy of the survey instrument is included in Appendix D.

4.2.1 Data collection

The County engaged CTC Technology & Energy (CTC) to administer the survey by phone. CTC coordinated and managed the survey project, including development of the questionnaire, sample selection, data collection, survey data analysis, and reporting of results. CTC obtained 36,090 randomly sampled phone numbers from its vendor Data Axle for the study. The County requested to have 12 zip codes oversampled. 55 percent of the records fell into the 12 zip codes to be oversampled, and 45 percent covered the remaining parts of the County. There were 400 completed surveys throughout the County.

The margin of error is a common measure of statistical validity or accuracy. The margin of error for aggregate results at the 95 percent confidence level for 400 responses is ±4.9 percent. That is, for questions with valid responses from all survey respondents, one would be 95 percent confident (19 times in 20) that the survey responses lie within ±4.9 percent of the target population as a whole. The margin of error is larger for various subgroups.

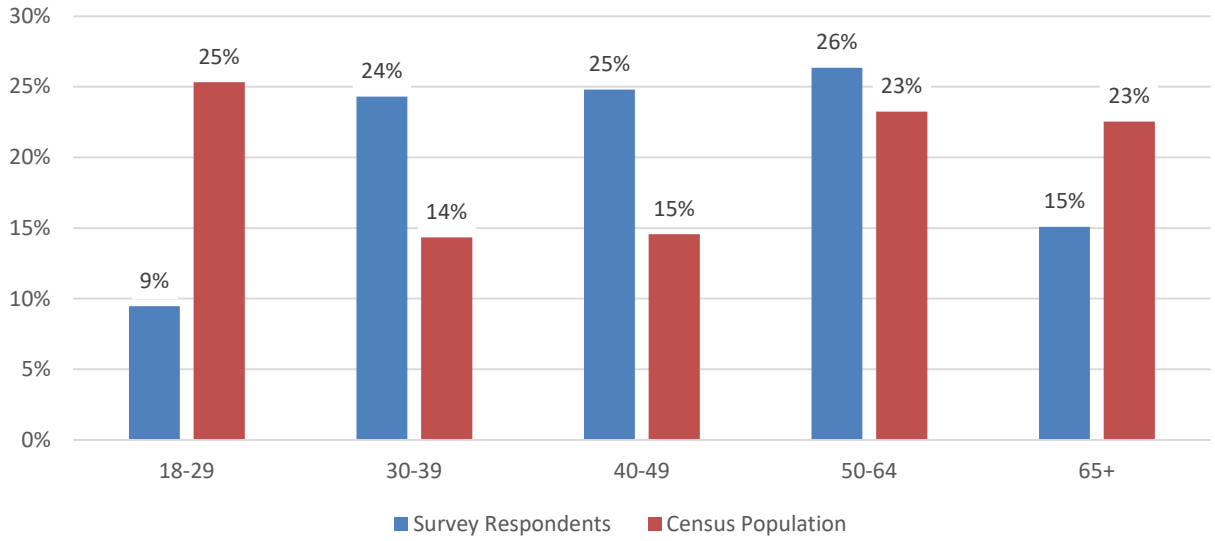
4.2.2 Data analysis

The survey responses were weighted based on the age of the respondent, household income, and ethnicity.[40] Since younger individuals, those in lower income households, and individuals of Hispanic, Latino, or Spanish origin were less likely to respond, the weighting corrects for the potential bias based on the age, household income, and ethnicity of the respondent. In this manner, the results more closely reflect the opinions of the County's adult population.

Figure 18 summarizes the sample and population distributions by age. Respondents were required to be age 18 or older to participate in the survey.

[40] The survey responses were entered into Statistical Package for the Social Sciences software (http://www-01.ibm.com/software/analytics/spss/) and the entries were coded and labeled. SPSS databases were formatted, cleaned, and verified prior to the data analysis. The survey data was evaluated using techniques in SPSS including frequency tables, cross-tabulations, and means functions. Statistically significant differences between subgroups of response categories are highlighted and discussed where relevant.

Figure 18: Age of respondents and Santa Cruz County adult population



4.3 Survey results

The results presented in this section are based on analysis of information provided by 400 residents of Santa Cruz County, from an estimated total of 97,353 households. Results are representative of the set of households with a confidence interval of ±4.9 percent at the aggregate level.

Unless otherwise indicated, the percentages reported are based on the "valid" responses from those who provided a definite answer and do not reflect individuals who said "don't know" or otherwise did not supply an answer because the question did not apply to them. Key statistically significant results ($p \leq 0.05$) are noted where appropriate.

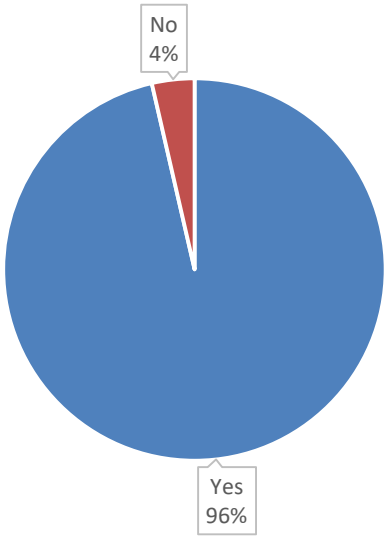
4.3.1 Residential internet service

Respondents were asked about their type of internet connection and providers. This information provides valuable insight into residents' need for various internet and related communications services.

4.3.2 Internet access

Almost all residents subscribe (96 percent) to home internet service as shown in the following figure.

Figure 19: Respondents who subscribe to home internet service



Internet usage is generally high across all demographic groups. Based on the data, seniors, households with veterans, and households with disabled individuals had slightly lower percentages of internet usages. Table 10 highlights the saturation of home internet usage by key demographic groups.

Table 10: Home internet usage by key demographics

	Total Internet Usage	*Weighted Count*
TOTAL	**96%**	***400***
Respondent Age		
18-29	97%	*99*
30-39	96%	*56*
40-49	98%	*57*
50-64	99%	*91*
65+	93%	*88*
Income		
Less than $100,000	97%	*123*
$100,000 to $199,999	96%	*69*
$200,000 or more	100%	*50*
Race/Ethnicity		
Hispanic/Latino	96%	*86*
White, non-Hispanic	97%	*187*
Other/more than one	100%	*30*
Household Size		
One HH member	97%	*85*
Two HH members	93%	*141*
Three HH members	98%	*80*

	Total Internet Usage	*Weighted Count*
Four + HH members	100%	*78*
Children in Household		
No children in HH	95%	*241*
Children in HH	99%	*144*
Seniors in Household		
No seniors in HH	98%	*285*
Seniors in HH	93%	*100*
Other Demographic Groups		
Veteran	83%	*44*
Individual with a disability	81%	*39*
Primarily non-English speaker	100%	*15*
Formerly incarcerated individual	100%	*15*
Actively enrolled in K-12 school or college or other higher education	99%	*158*

Only 14 out of 400 respondents claimed that they had no internet service. 10 of these 14 said they had no service at all, five said they used a cellular connection to access the internet, and one claimed using a mobile hotspot. (Respondents could choose more than one answer.) As illustrated in Figure 20 respondents cited a variety of reasons for not having home internet service. Five out of 14 respondents without internet said it is not available in the area, and three said they recently moved or are in the process of moving.

Figure 20: Reasons for not having home internet access

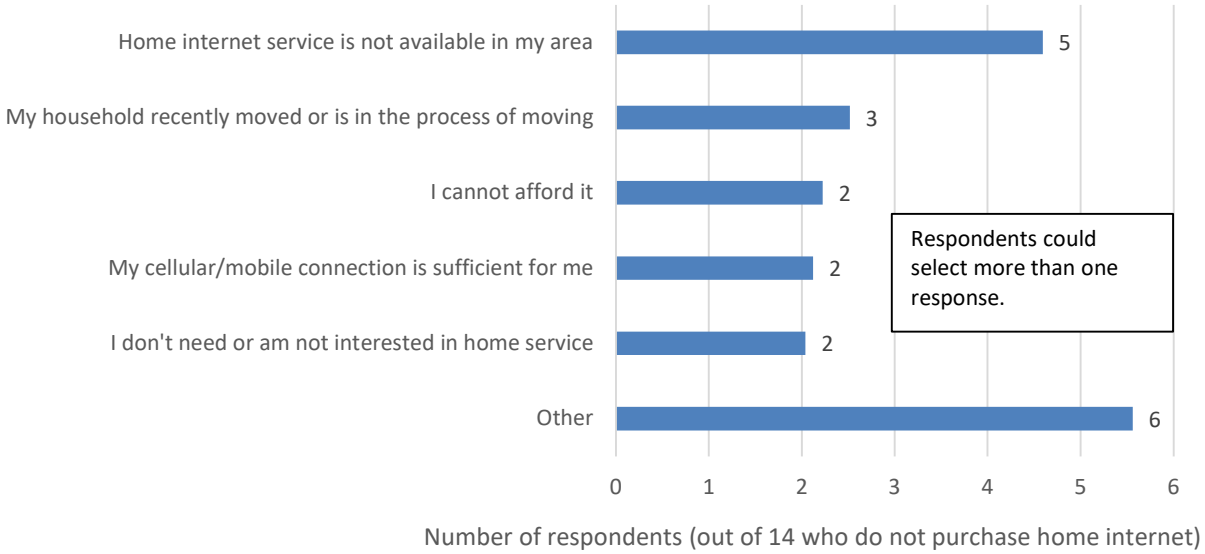
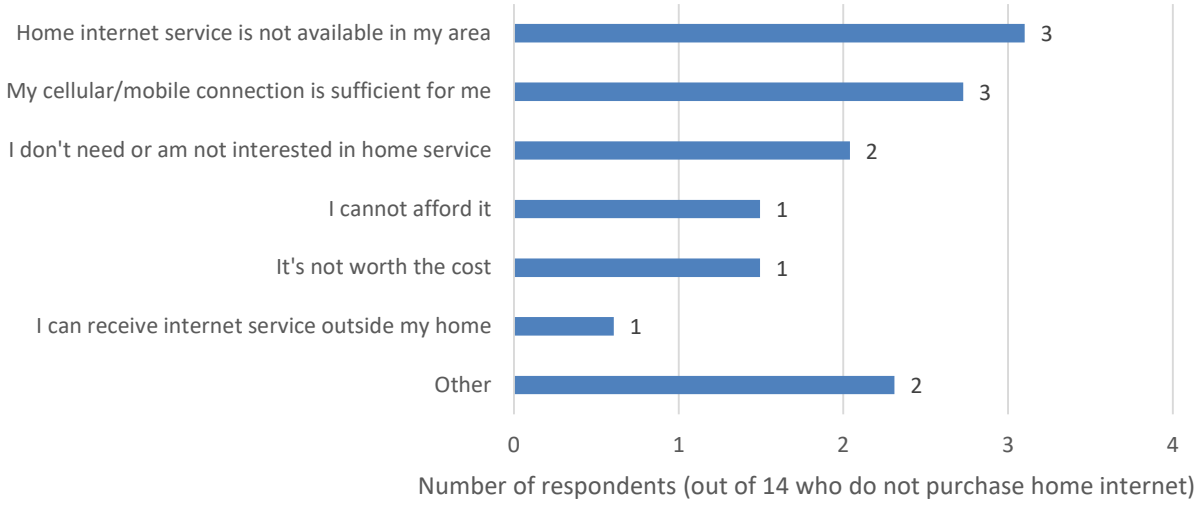


Figure 21 highlights the most important reason given for not having home internet service. Three respondents said home internet service is not available in their area, and three said their cellular/ mobile connection is sufficient. Note that the sample size is only 14 respondents.

Figure 21: Most important reason for not having home internet access

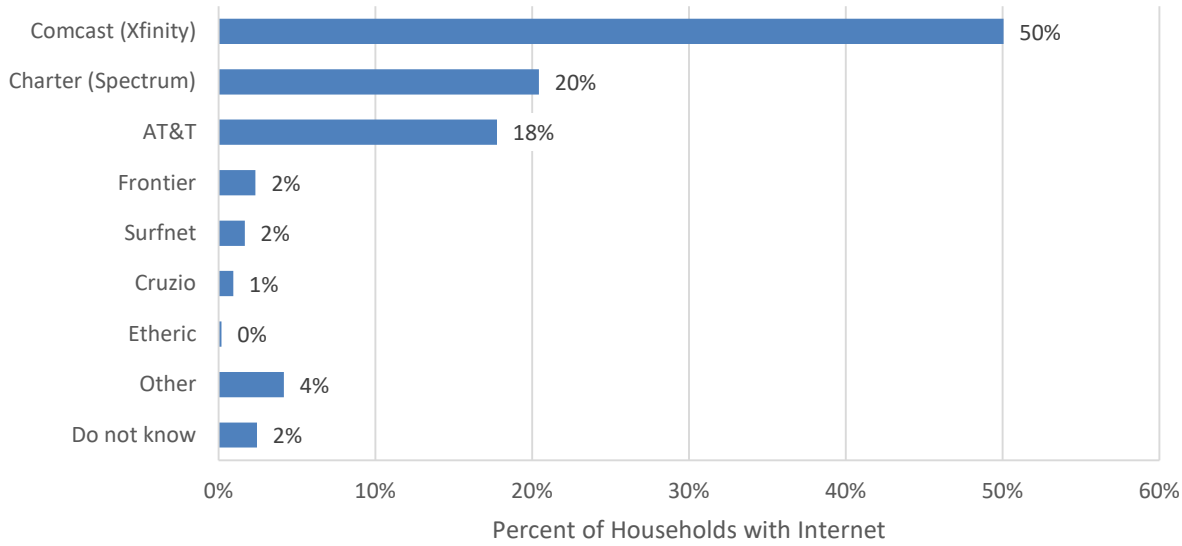


4.3.2.1 Service providers

Respondents with home internet service were asked a series of questions about their service, including their provider, reliability of service, and price paid.

Comcast/Xfinity is the leading provider, used by 50 percent of households with internet service, followed by Charter/Spectrum (20 percent) and AT&T (18 percent), as shown in Figure 22.

Figure 22: Home ISPs

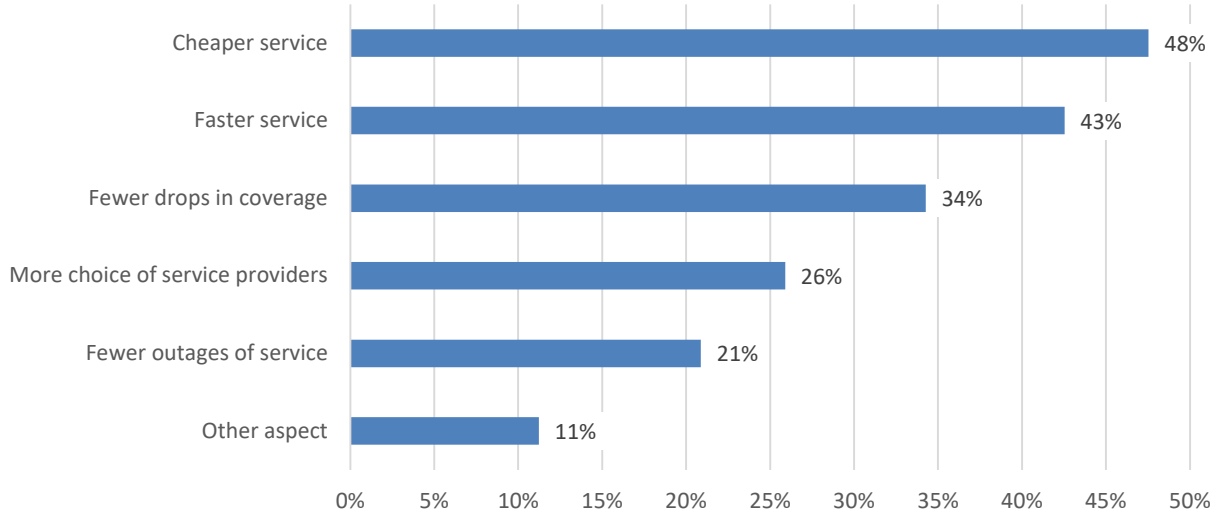


See Appendix E for statistics on providers by households with children and students under the heading 'Internet service providers by household type.'

4.3.2.2 Service improvement and reliability

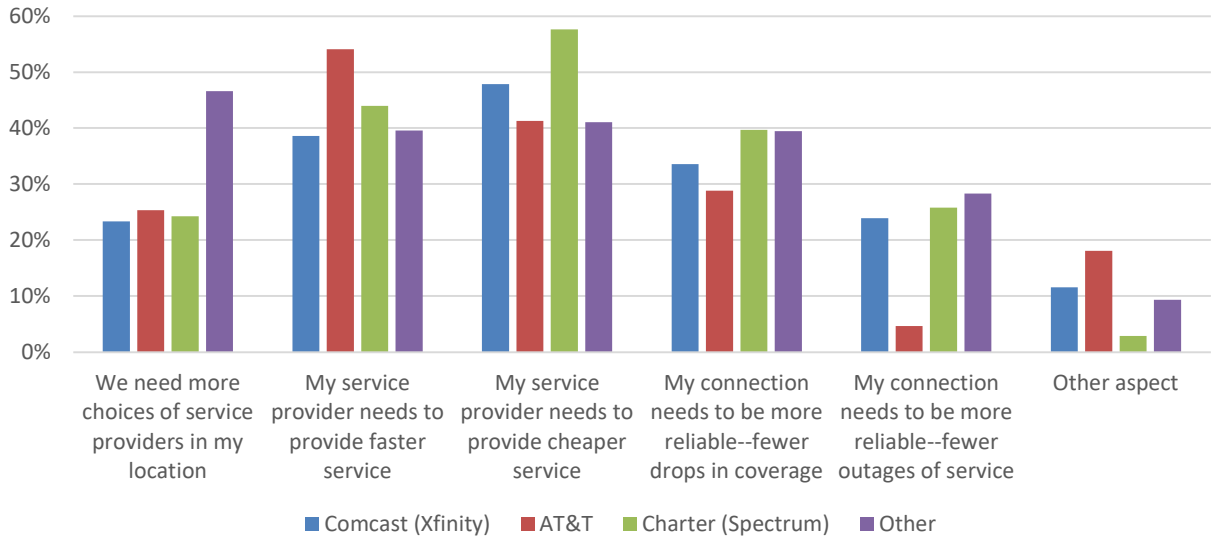
Home internet subscribers were asked to select the most important aspects of their home internet service that need to be improved. Nearly one-half (48 percent) of respondents cited a need for cheaper service, and 43 percent said their service provider needs to provide faster service (see Figure 23).

Figure 23: Most important aspects of internet service that need improvement



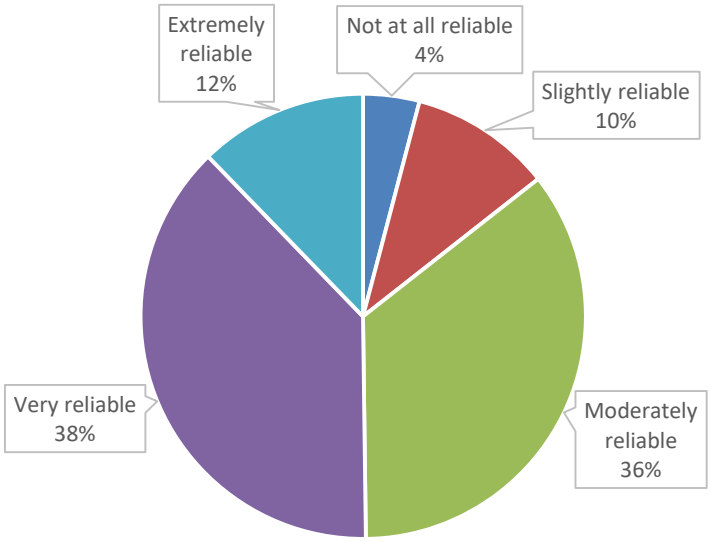
As illustrated in Figure 24, AT&T customers were more likely to say that they need faster service and were less likely than other customers to say their connection should have fewer outages. Charter customers were more likely to say that they need cheaper service.

Figure 24: Most important service aspects that need improvement by ISP



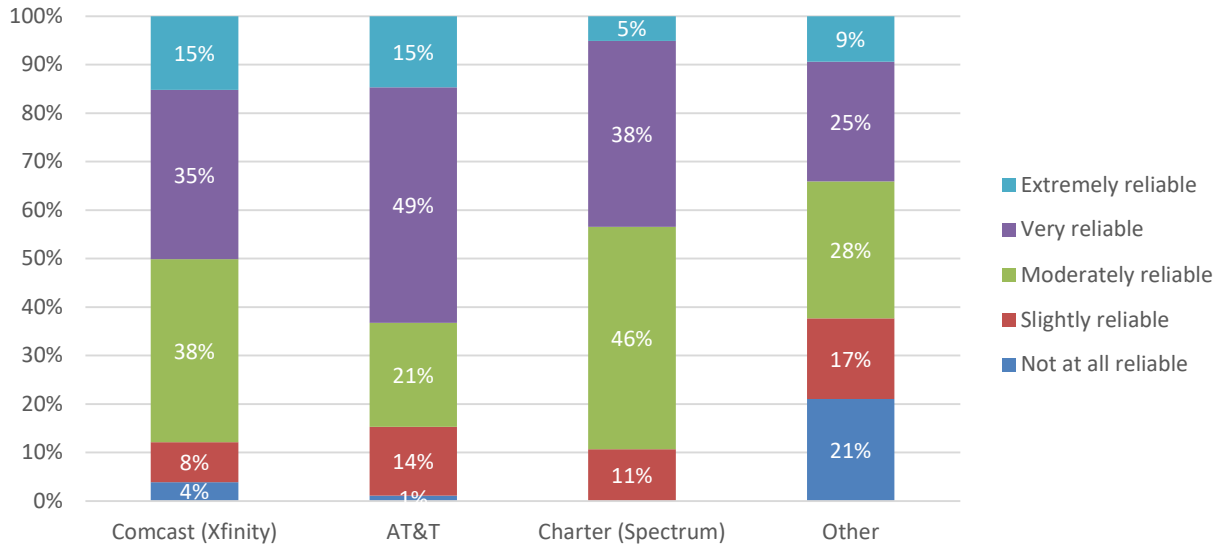
Respondents were also asked to evaluate the reliability of their internet service. One-half of respondents said their internet service is extremely reliable (12 percent) or very reliable (38 percent). Another 36 percent of subscribers said their internet service is moderately reliable.

Figure 25: Reliability of home internet service



AT&T customers were more likely than others to describe their service as very reliable (49 percent). 46 percent of Charter (Spectrum) customers cited their service as moderately reliable.

Figure 26: Reliability of home internet service by home ISP



Sixty-five percent of home internet subscribers experienced internet connectivity problems during a severe weather event (see Figure 27). Seventy percent of Comcast (Xfinity) customers experienced these issues, compared with 55 percent of AT&T customers and 58 percent of Charter (Spectrum) customers (see Figure 28). For connectivity issues by type of household, please see Appendix E.

Figure 27: Experienced internet connectivity problems

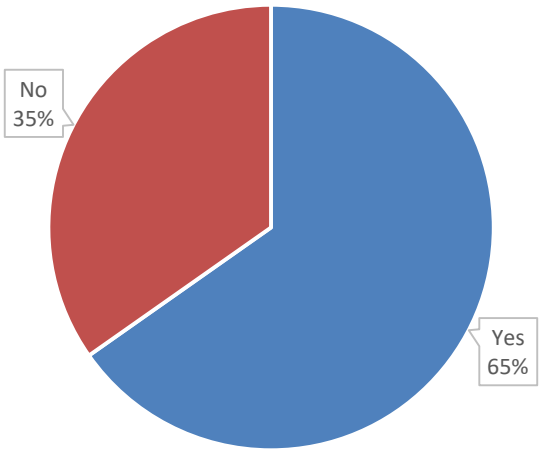
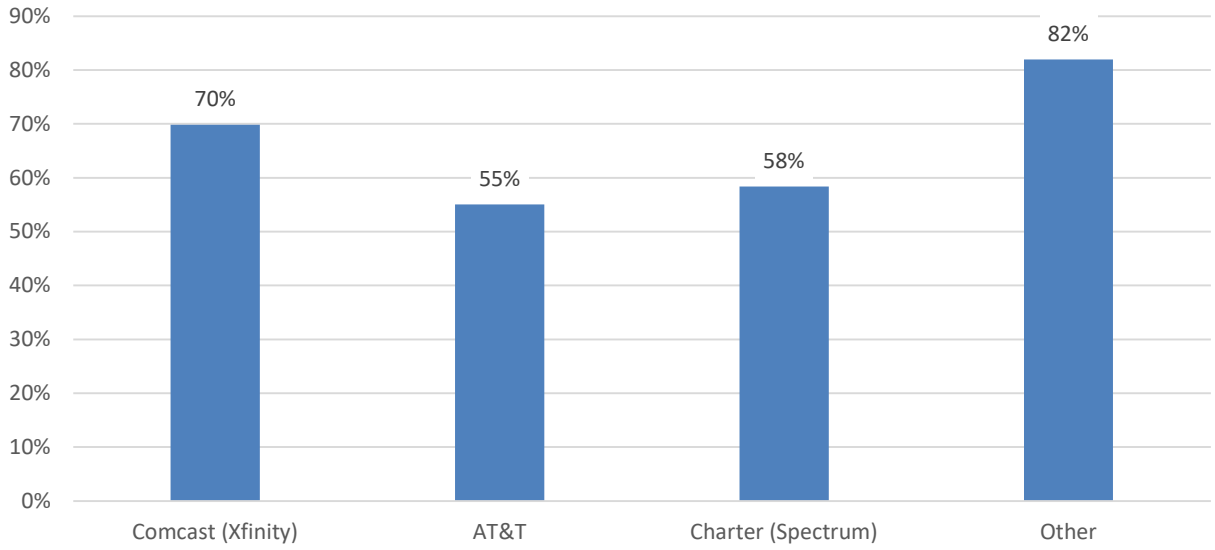


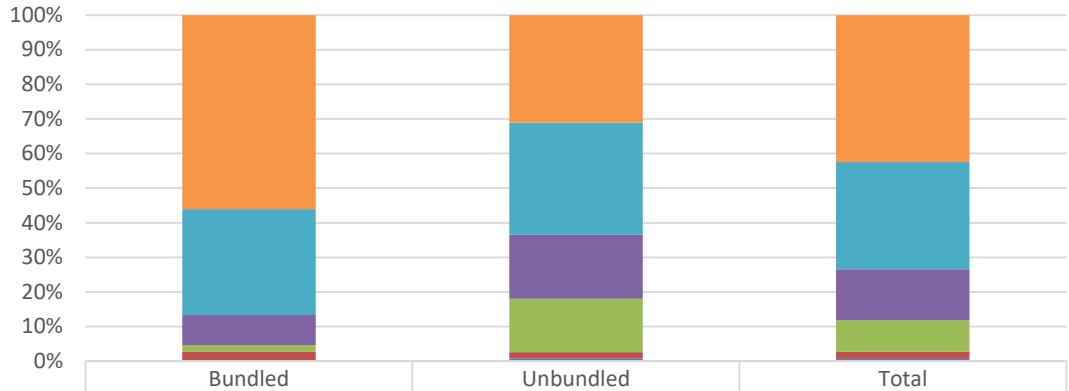
Figure 28: Internet connectivity problems by service provider



4.3.2.3 Cost of internet service

Respondents were asked to give the cost of their home internet service, and if their service is bundled TV and/or phone service. More than 40 percent of subscribers pay $100 or more per month for their home internet service (see Figure 29). More than one-half (56 percent) of those with bundled service pay at least $100 per month, compared with 31 percent of those with internet-only service.

Figure 29: Monthly price for internet service



	Bundled	Unbundled	Total
$100 or more	56%	31%	42%
$80 - $99	31%	32%	31%
$60 - $79	9%	19%	15%
$40 - $59	2%	15%	9%
$20 - $39	3%	2%	2%
$0 - $19	0%	1%	1%

$0 - $19 $20 - $39 $40 - $59 $60 - $79 $80 - $99 $100 or more

Overall, 37 percent of subscribers bundle their internet service, as illustrated in Figure 30. Four in 10 Comcast (Xfinity) and Charter (Spectrum) customers have bundled service, compared with 28 percent of AT&T customers.

Figure 30: Internet service bundled with TV and/or phone service by provider

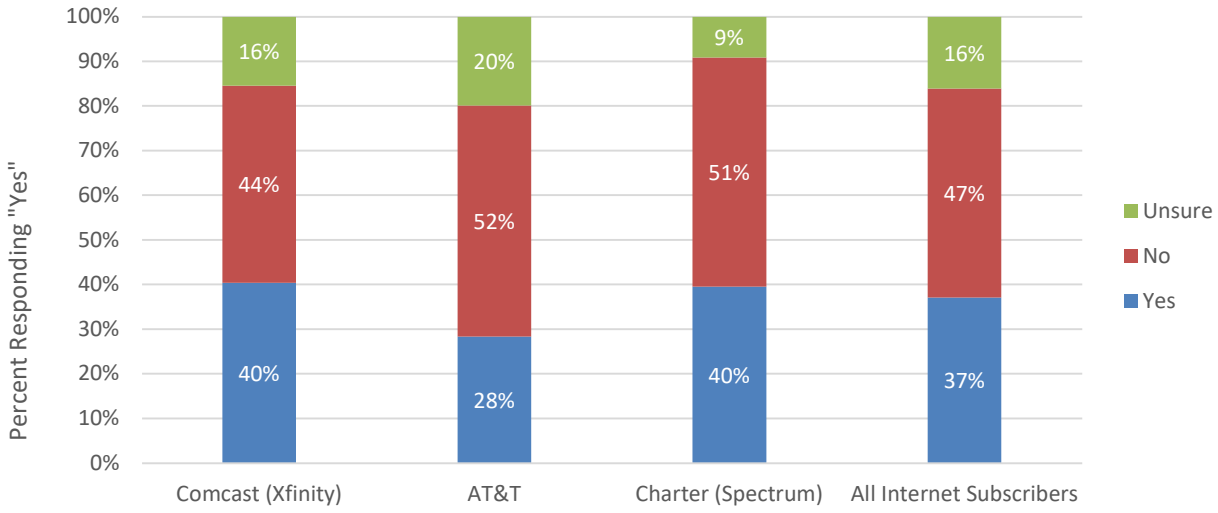
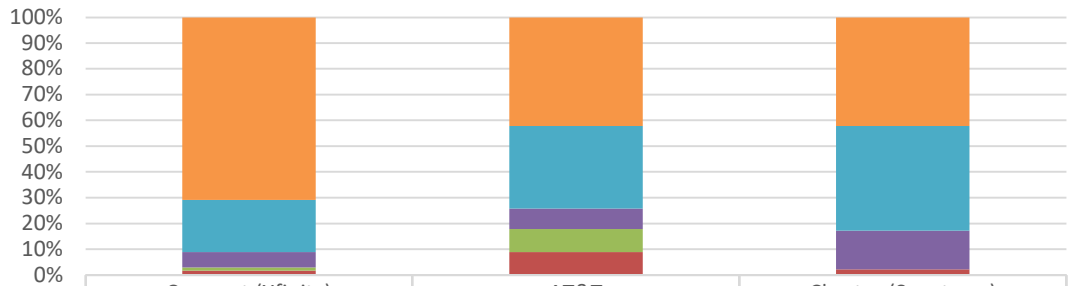


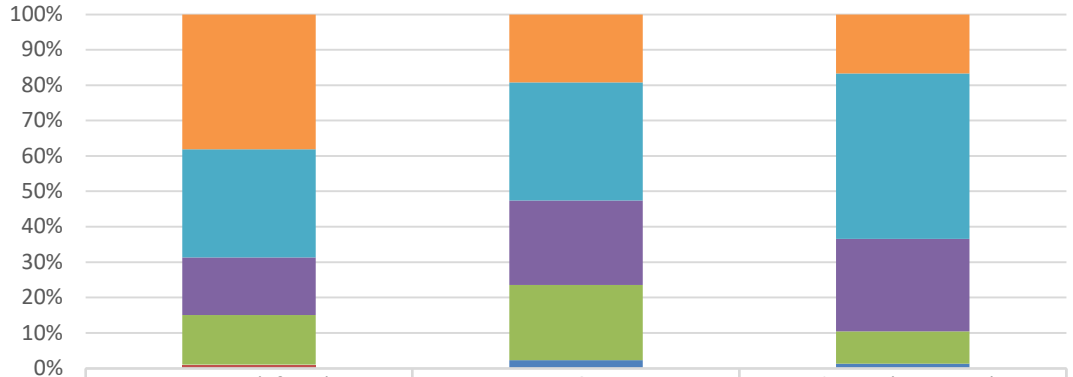
Figure 31 and Figure 32 show the bundled and unbundled cost of internet service for the leading providers. Although the data suggest that Comcast (Xfinity) customers pay more per month, the results are based on relatively small counts.

Figure 31: Monthly price for bundled internet service by ISP



	Comcast (Xfinity) (n=59)	AT&T (n=17)	Charter (Spectrum) (n=26)
$100 or more	71%	42%	42%
$80 - $99	20%	32%	41%
$60 - $79	6%	8%	15%
$40 - $59	1%	9%	0%
$20 - $39	2%	9%	2%
$0 - $19	0%	0%	0%

Figure 32: Monthly price for unbundled internet service by ISP



	Comcast (Xfinity) (n=74)	AT&T (n=32)	Charter (Spectrum) (n=35)
$100 or more	38%	19%	17%
$80 - $99	31%	33%	47%
$60 - $79	16%	24%	26%
$40 - $59	14%	21%	9%
$20 - $39	1%	0%	0%
$0 - $19	0%	2%	1%

All respondents were asked to estimate what they believe is a reasonable price to pay for high-speed, reliable home internet service. About one-fourth (26 percent) of respondents believe a reasonable price is less than $39 per month, and 19 percent believe a reasonable price is $80 or more per month (Figure 33). As shown in Figure 34, 21 percent of those earning $200,000 or more per year said a reasonable price for internet service is $100 or more per month.

Figure 33: Reasonable price to pay per month for high-speed, reliable home internet service

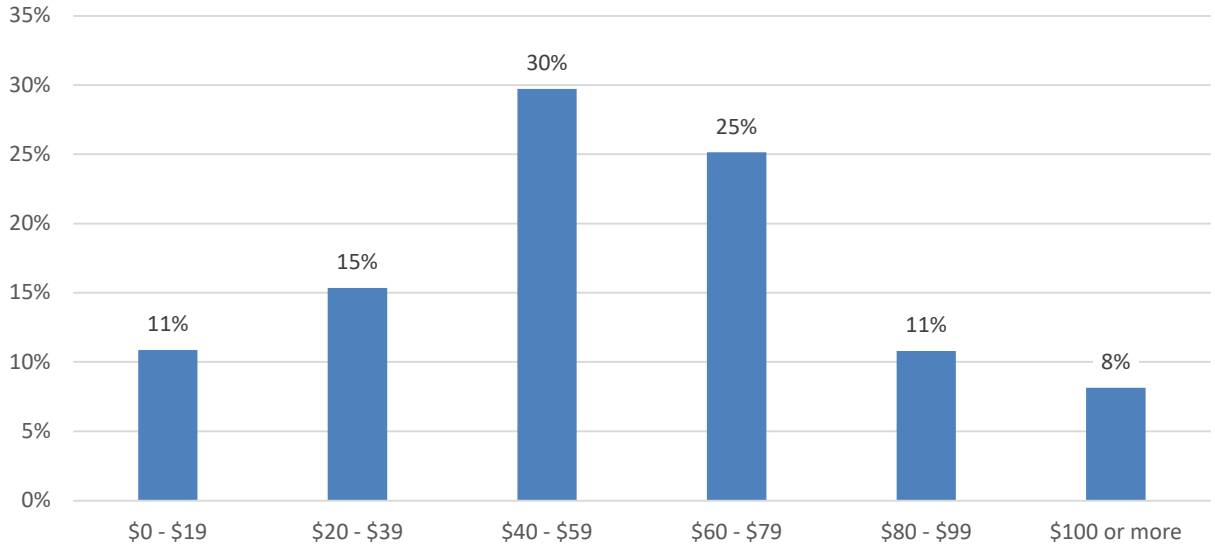


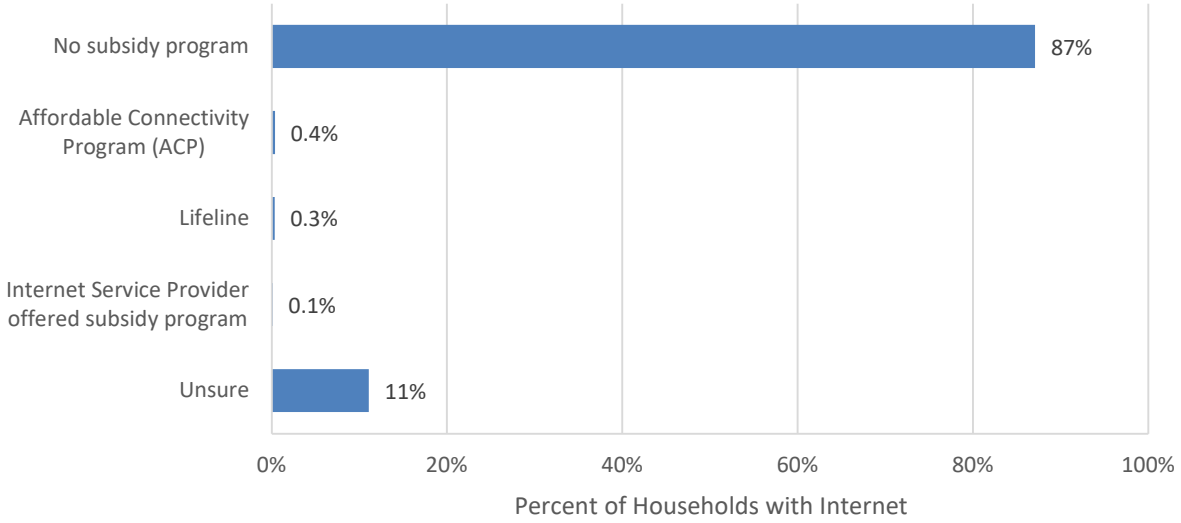
Figure 34: Reasonable price to pay per month for high-speed, reliable home internet service by household income

	Less than $100,000	$100,000 to $199,999	$200,000 or more
$100 or more	4%	7%	21%
$80 - $99	7%	9%	13%
$60 - $79	34%	40%	15%
$40 - $59	24%	32%	32%
$20 - $39	21%	8%	7%
$0 - $19	11%	4%	12%

4.3.2.4 Discount or subsidy programs

Less than one percent of respondents that report having an internet subscription are enrolled in the ACP, Lifeline, or an ISP-offered subsidy program, as illustrated in Figure 35.

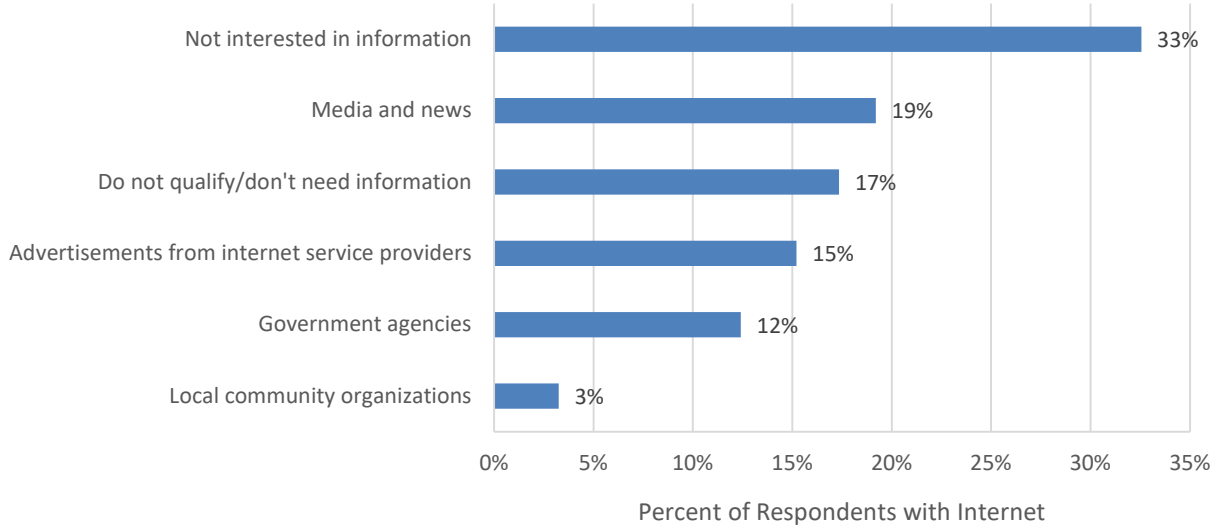
Figure 35: Enrolled in broadband discount or subsidy program



One-third of respondents with home internet service said they are not interested in information about discounted internet services or government subsidy programs, while 17 percent do not believe they would qualify and do not need information (see Figure 36). Trusted sources of

information include media and news (19 percent), advertisements from internet service providers (15 percent), and government agencies (12 percent).

Figure 36: Trusted sources for receiving information about discounted internet services or government subsidy programs

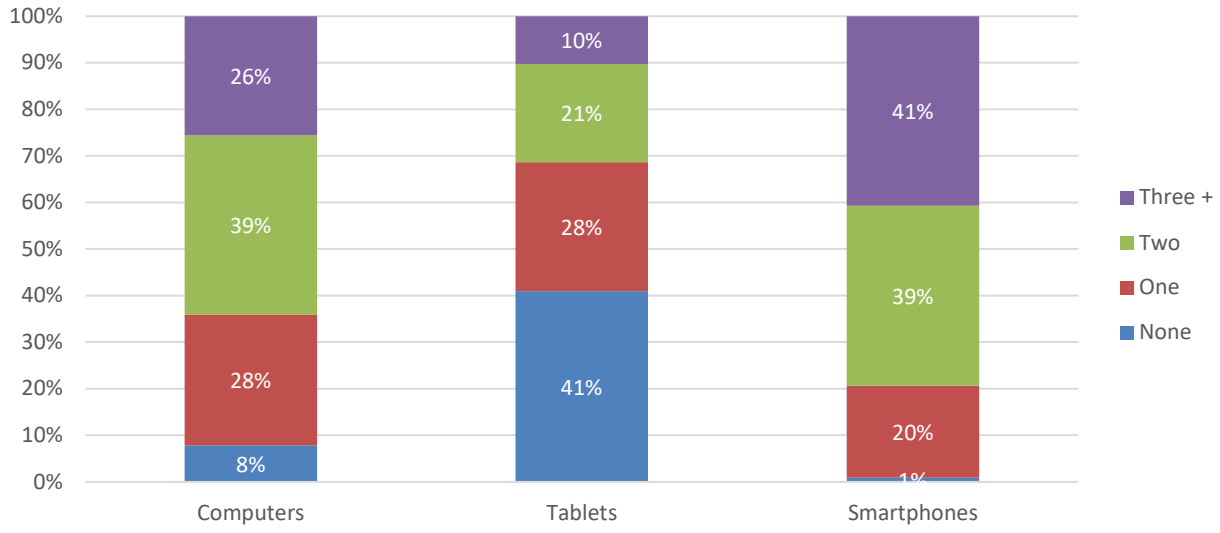


When asked to name community organizations they rely on for useful information, internet subscribers cited a variety of sources, including local government (including City and County) and a variety of news sources such as newspapers and television.

4.3.3 Device ownership

Respondents were asked a series of questions about the computing devices used in their household, as well as how long it would take to replace a lost or damaged computer. Almost all households have at least one smartphone (99 percent) or computer (92 percent), and more than half have a tablet computer (59 percent), as shown in Figure 37.

Figure 37: Number of computing devices in the household



Households with an annual income of less than $100,000 per year have fewer devices on average than households with a higher annual income (see Table 11.) Specifically, 37 percent of households earning $200,000 or more per year have at least five computers, 30 percent have five or more tablets, and 69 percent have five or more cell phones.

Table 11: Number of computing devices by household income

		Less than $100,000	$100,000 to $199,999	$200,000 or more
Desktop computers/laptops	None	7%	7%	4%
	1 - 2	44%	21%	10%
	3 - 4	38%	37%	48%
	5 or more	11%	35%	37%
	Total Weighted Count	*123*	*69*	*50*
Tablets	None	53%	31%	25%
	1 - 2	28%	38%	30%
	3 - 4	16%	23%	15%
	5 or more	2%	8%	30%
	Total Weighted Count	*123*	*69*	*50*
Smartphones	None	1%	1%	0%
	1 - 2	34%	18%	6%
	3 - 4	35%	39%	24%
	5 or more	30%	42%	69%
	Total Weighted Count	*123*	*69*	*50*

The number of personal computing devices in the home is strongly associated with household size. Nearly nine in 10 households with four or more members have three or more computers, and 97 percent have three or more smartphones (see Table 12).

Table 12: Number of computing devices in the household by household size

		One HH member	Two HH members	Three HH members	Four + HH members
Desktop computers/laptops	None	14%	7%	5%	6%
	1 - 2	61%	24%	15%	9%
	3 - 4	11%	49%	45%	43%
	5 or more	15%	19%	34%	43%
	Total Weighted Count	*85*	*141*	*80*	*78*
Tablets	None	64%	37%	33%	29%
	1 - 2	25%	30%	30%	23%
	3 - 4	10%	29%	23%	19%
	5 or more	2%	4%	14%	29%
	Total Weighted Count	*85*	*141*	*80*	*78*
Smartphones	None	0%	1%	1%	2%
	1 - 2	74%	4%	1%	2%
	3 - 4	16%	64%	38%	20%
	5 or more	10%	32%	60%	77%
	Total Weighted Count	85	*141*	*80*	*78*

4.3.4 Computer and internet skills

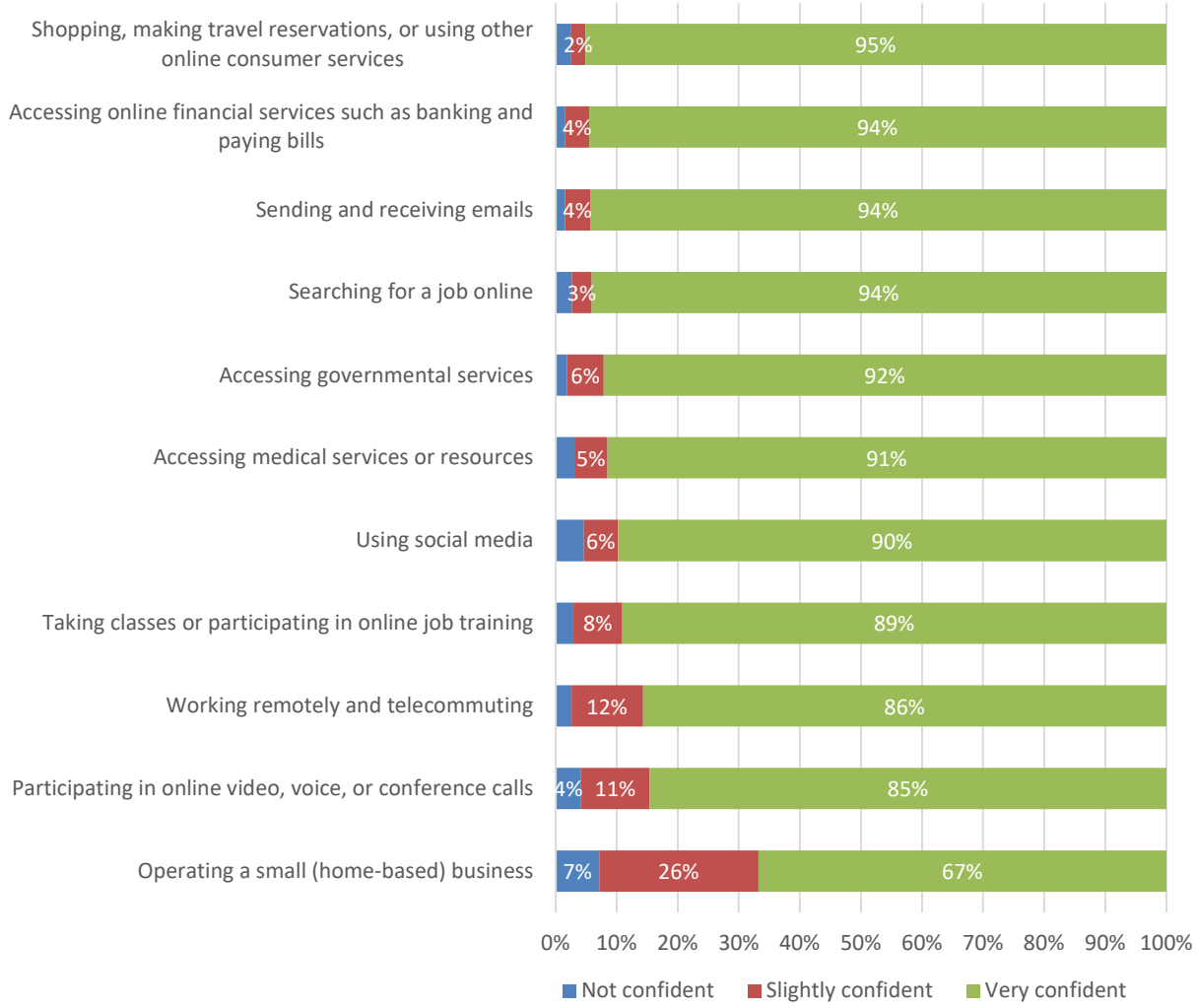
Respondents were asked a series of questions about their skills using computers and the internet. This information provides valuable insight into where there may be gaps in abilities and opportunities to educate residents.

4.3.4.1 Confidence in computer and internet skills

Respondents were asked to indicate how confident they are with various computer and internet skills. Santa Cruz County residents are highly skilled in all areas evaluated, with the majority citing that they are very confident in all the digital literacy skills listed in the survey.

For example, almost all respondents said they or the primary user are very confident in most skills, such as using online consumer services (95 percent), accessing financial services (94 percent), sending and receiving emails (94 percent), and searching for a job online (94 percent), as shown in Figure 38. Respondents are somewhat less confident with job-related skills (86 percent cited that they are very confident in working remotely). Still, two-thirds of those who responded or said it was applicable indicated they or the primary user are very confident in their ability to operate a small (home-based) business.

Figure 38: Confidence in internet and computer skills

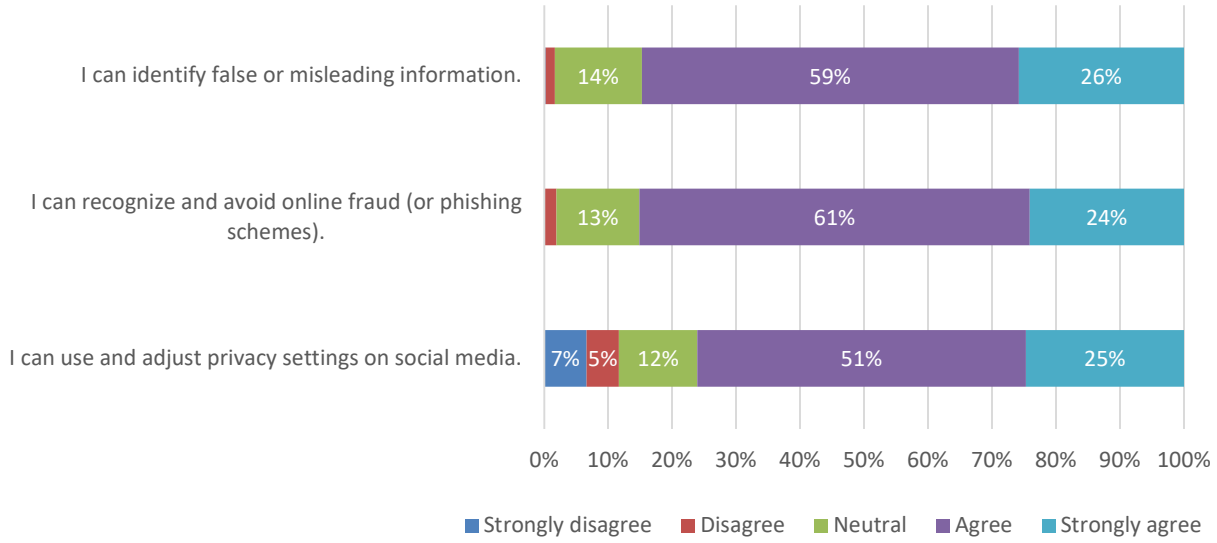


For confidence in computer and internet skills based on households with veterans or individuals with a disability, please see Appendix E.

4.3.4.2 Assessment of internet skills related to security and privacy

Respondents were also asked about their level of agreement with statements about their internet skills, as highlighted in Figure 39. Most respondents agreed or strongly agreed that they can identify false or misleading information (85 percent), recognize and avoid online fraud (85 percent), and use and adjust privacy settings on social media (76 percent).

Figure 39: Agreement with statements about internet skills



For assessment of internet skills by number of members in the household please see Appendix E.

4.3.5 Demographics

Basic demographic information was gathered from survey respondents and is summarized in this section. Several comparisons of respondent demographic information and other survey questions were provided previously in this report.

As indicated previously regarding age-weighting, a lower percentage of survey respondents were in the 65+ category and the 18-39 category relative to the County's adult population as a whole. Approximately 15 percent of survey respondents are ages 65+ years, compared to 23 percent of the population, and approximately 9 percent of survey respondents are age 18-29 compared to 25 percent of the population (see Figure 40). The weighted survey results presented in this report are adjusted to account for these differences and to provide results that are more representative of the County's population, as discussed previously. The following chart compares the survey age to the age distribution of adults in the population.

Figure 40: Age of respondents and Santa Cruz County adult population

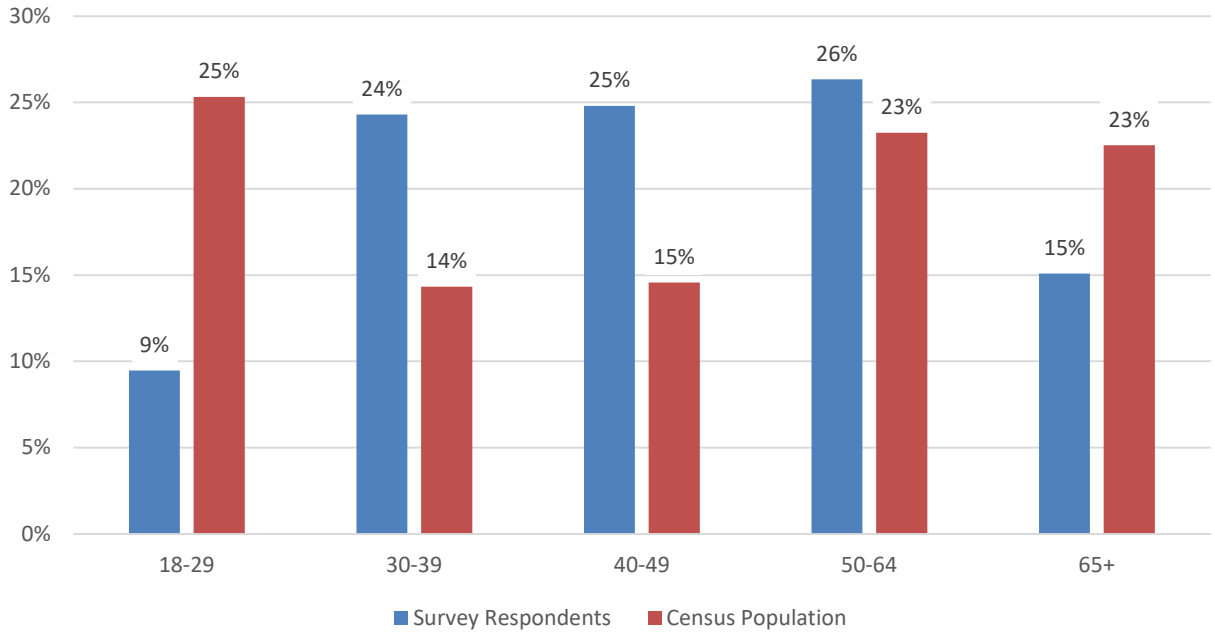


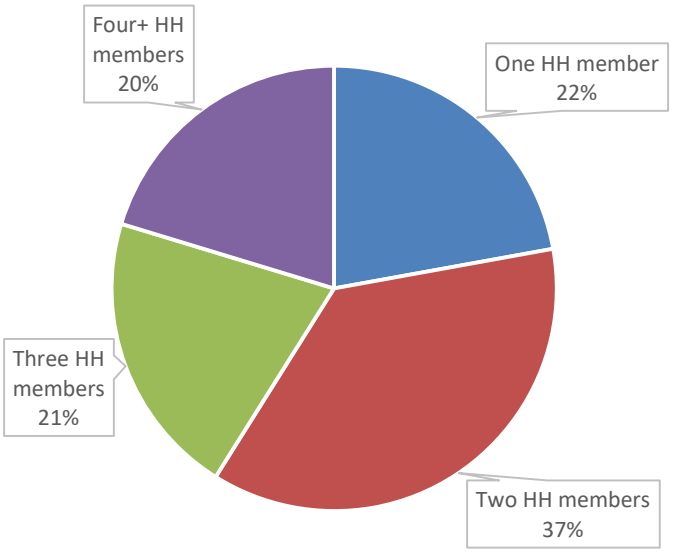
Table 13 highlights the demographic characteristics of survey respondents, broken out by respondent age. Respondents ages 65+ are more likely than younger respondents to be white (84 percent), have no children at home (97 percent), and have a veteran in the household (26 percent). More than one-half of respondents under age 50 have a K-12 or higher education student in the household.

Table 13: Demographic profile by respondent age

		Age Group					
		18-29	30-39	40-49	50-64	65+	Total
Income	Less than $100,000	61%	64%	45%	35%	49%	51%
	$100,000 to $199,999	21%	21%	40%	37%	26%	28%
	$200,000 or more	18%	15%	15%	28%	25%	21%
	Total	*71*	*38*	*32*	*52*	*48*	*241*
Race/ethnicity	Hispanic/Latino	57%	33%	26%	18%	14%	28%
	White	39%	56%	64%	61%	84%	62%
	Other	4%	11%	10%	21%	2%	10%
	Total	*66*	*40*	*44*	*74*	*76*	*302*
Number of household members	One HH member	27%	21%	11%	26%	19%	22%
	Two HH members	29%	28%	18%	44%	56%	37%
	Three HH members	25%	21%	26%	19%	14%	21%
	Four+ HH members	19%	29%	44%	11%	11%	20%
	Total	*99*	*55*	*56*	*89*	*84*	*385*
Children in household	No children in household	48%	35%	37%	79%	97%	63%
	Children in household	52%	65%	63%	21%	3%	37%
	Total	*99*	*55*	*56*	*89*	*84*	*385*
Seniors in household	No seniors in household	95%	95%	95%	92%	4%	74%
	Seniors in household	5%	5%	5%	8%	96%	26%
	Total	*99*	*55*	*56*	*89*	*84*	*385*
At-risk groups	Veteran	9%	6%	5%	7%	26%	11%
	Individual with a disability	5%	9%	9%	13%	13%	10%
	Primarily non-English speaker	8%	5%	4%	1%	2%	4%
	Formerly incarcerated individual	3%	5%	2%	4%	5%	4%
	Actively enrolled in K-12 school or college or other higher education	56%	53%	57%	31%	12%	40%
	Total	*99*	*56*	*57*	*91*	*88*	*400*

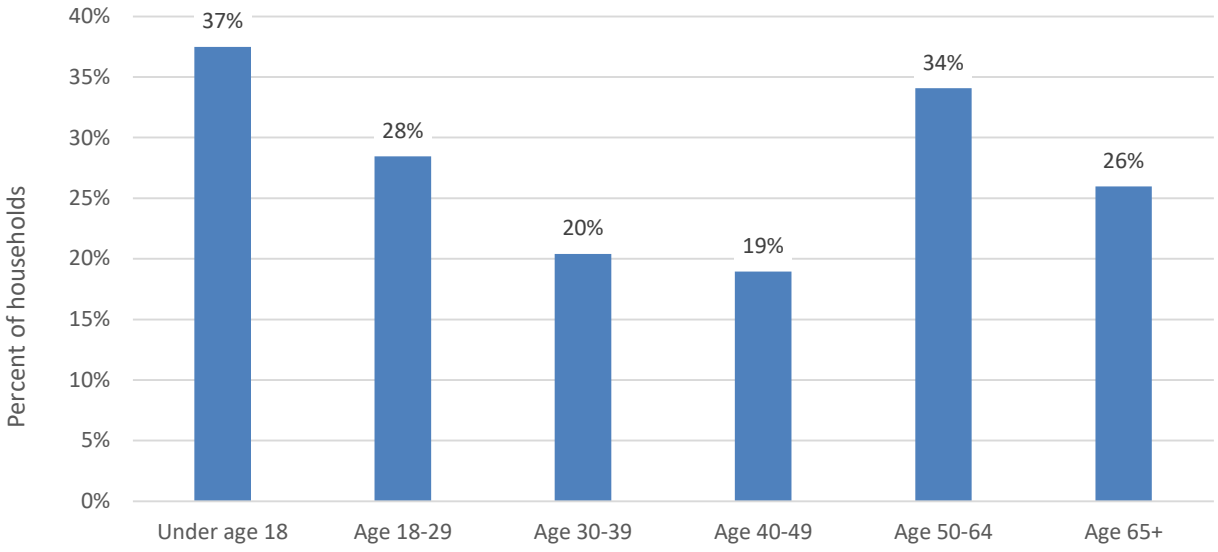
Respondents were asked to indicate the number of individuals in their household in each age category. 37 percent of households have two members, and 41 percent have three or more members. Just 22 percent of respondents live alone (see Figure 41).

Figure 41: Total household size



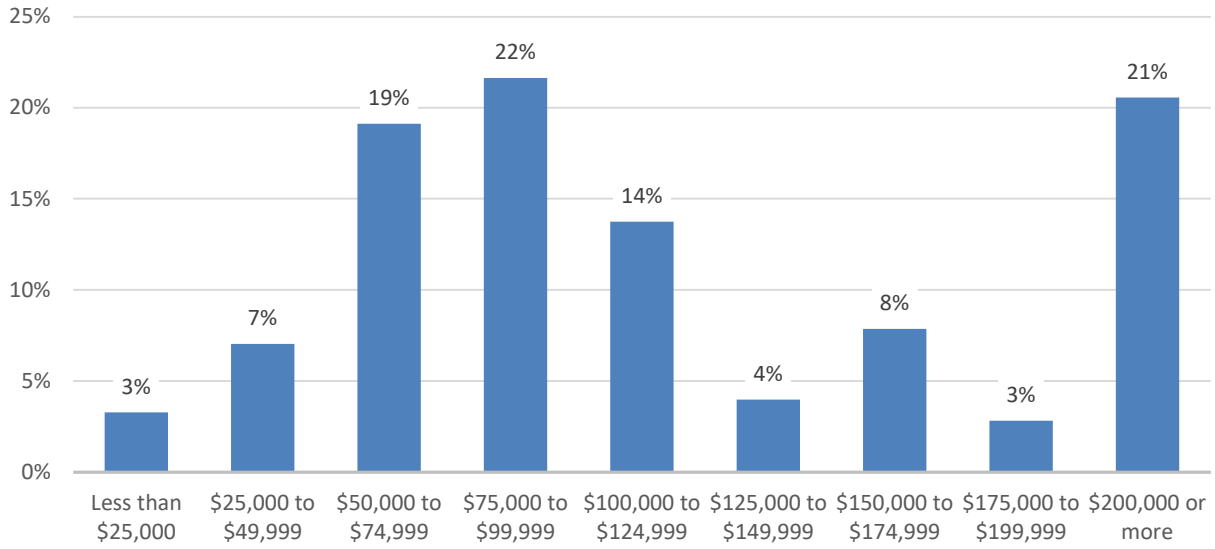
More than one-third (37 percent) of households have members under the age of 18, and 26 percent of households have at least one senior, ages 65+.

Figure 42: Percent of households with members in each age category



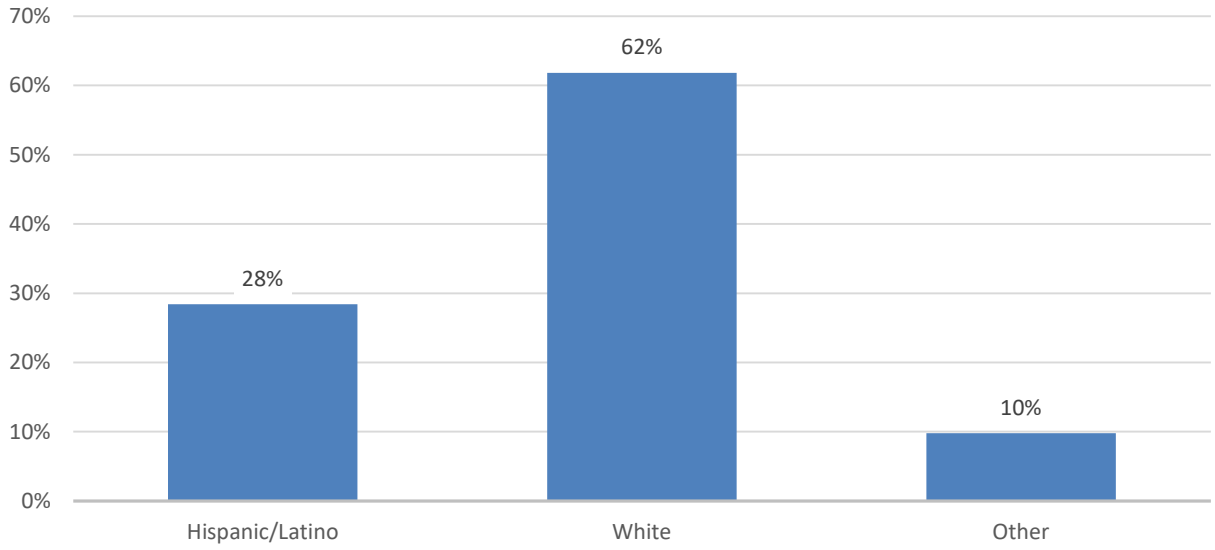
As illustrated in Figure 43, weighted survey data includes more than one-half (51 percent) of households earning under $100,000 per year, 28 percent earning $100,000 to $199,999 per year, and 21 percent earning $200,000 or more per year.

Figure 43: Annual household income



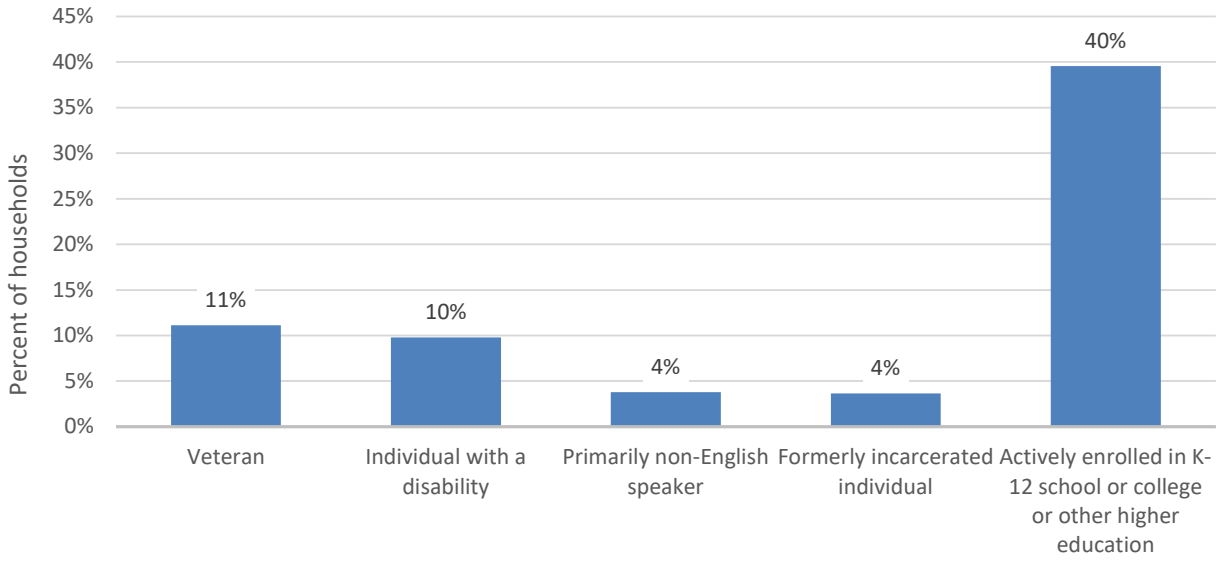
Responses to the race/ethnicity question were grouped to correspond as closely as possible to U.S. Census categories. These categories were used in weighting the survey data by race and ethnicity. Overall, 28 percent of the weighted sample of respondents are Hispanic/Latino (of any race). Another 62 percent are white, and 10 percent are of another race/ethnicity or multiple races/ethnicities, including five percent who are Black.

Figure 44: Race/ethnicity of respondents



Respondents were asked if there was a household member in various at-risk groups, as shown in Figure 45. Four in 10 respondents have a K-12 or higher education student in the household. Respondents are less likely to have a veteran (11 percent), individual with a disability (10 percent), primarily non-English speaker (4 percent), and a formerly incarcerated individual (4 percent) in the household.

Figure 45: Type of household member



4.4 Speed test results showed several areas of the County where actual speeds fell below promised speeds by ISPs

The County also sponsored a speed test that incorporated a brief survey to capture service speeds and customer experience. (See Appendix F). There were 732 speed tests completed over approximately 6 months. Table 14 shows the types of devices used for the speed tests. Table 15 shows the distribution of speed tests by ISP.

Table 14: Devices used for speed test

Type of device	Percentage
Desktop	17%
Laptop	45%
Smartphone	31%
Tablet	7%

Table 15: Speed tests by provider

Provider	Percentage
Comcast	52.6%
AT&T	27.6%
Charter Spectrum	6.6%
Verizon	3.0%
Cruzio	2.7%
Starlink	2.5%
Frontier Communications	2.4%
Viasat	1.2%
T-Mobile	0.7%
HughesNet	0.4%
Ridge Wireless	0.3%

The speed test results largely confirmed that "covered" areas are performing below expectations. 510 of the tests performed showed that subscribers received less than 100/20—rendering them effectively underserved. Also concerning was that 126 of the test results were below the minimum definition of broadband (at least 25/3), making subscribers effectively unserved. Figure 46 shows test results by speed thresholds of under 25/3 and under 100/20. Figure 47 shows the distribution of speed tests by price paid for internet service.

Figure 46: Speed test results

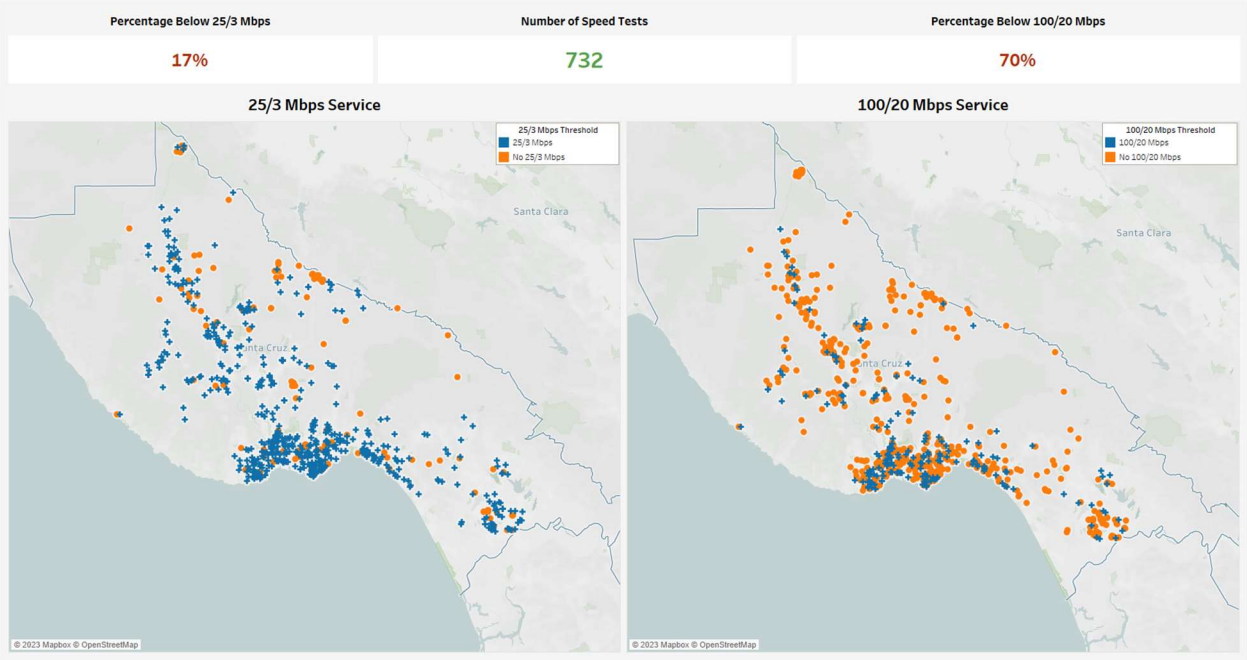
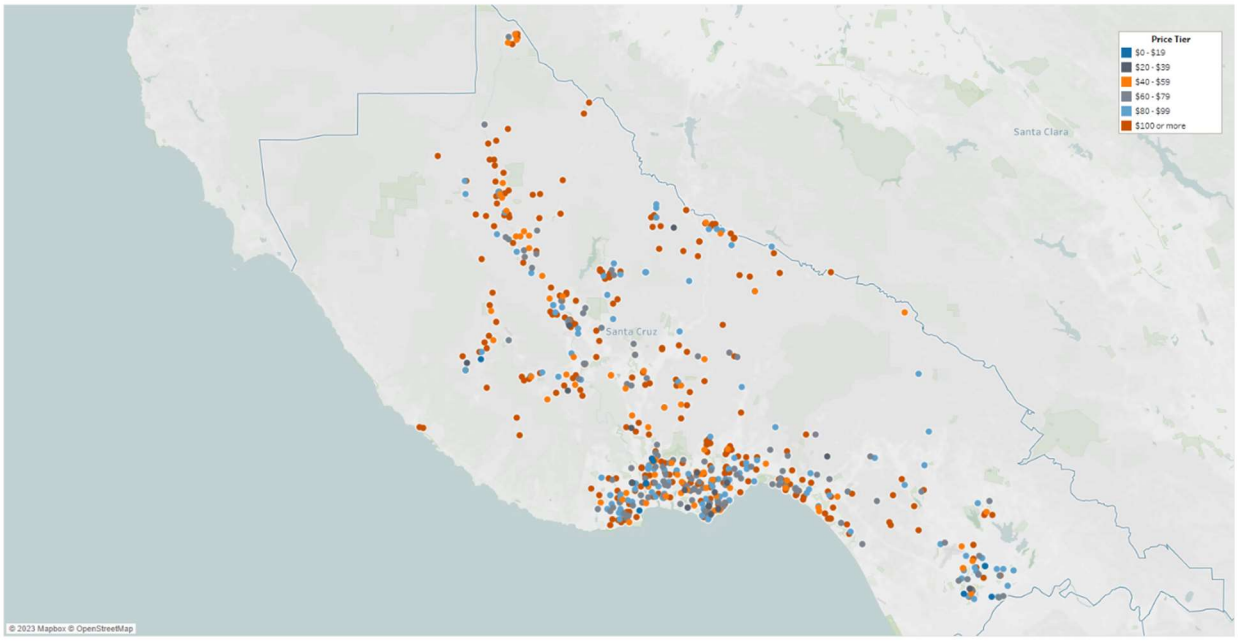


Figure 47: Speed test results by price tier



5 Three different infrastructure designs and cost estimates offer a range of investment required to provide 100/100 Mbps speeds to the County

The internet availability analysis determined that less than 28 percent of the County's households and businesses have access to 100/100 Mbps speeds using fiber technologies, and the remaining locations are served by a mix of other technologies, including cable, fixed wireless, DSL and satellite.

Santa Cruz County's physiographic features present significant challenges for ISPs favoring wireline deployments. To overcome these obstacles there is a robust network of communication towers that is used by ISPs and other entities to overcome the challenges and provide cost-effective communication solutions, including broadband internet, to public facilities, residents, and businesses.

CTC completed three different infrastructure designs and cost estimates that demonstrate the range of investment required to provide 100/100 Mbps speeds to households and businesses in the County currently receiving speeds less than 100/100 Mbps.

The first design is an FTTP infrastructure that connects all 57,626 locations within the County that currently have Internet speeds less than 100/100 Mbps.

The second design is a FTTP infrastructure that connects 3,974 locations within the County that are considered underserved or unserved, with Internet speeds less than 100/20 Mbps.

The third design is a high-speed Fixed Wireless Access (FWA) infrastructure using existing tower infrastructure that provides 100/100 Mbps service to 49,266 (approximately 85 percent) of the 57,626 locations that currently have Internet speeds less than 100/100 Mbps, including approximately 70 percent (2,789) of the 3,974 locations receiving speeds less than 100/20 Mbps.

5.1 Factors considered in the determination of CAPEX for the FTTP infrastructure designs

Physical address Information for the network core hub sites and each location was entered into the ArcGIS Network Analyzer tool to generate fiber routes, fiber mileage (backbone, primary, secondary, and tertiary), fiber drops, fiber distribution centers (FDCs) and fiber taps for the design.

The assessment of Make-Ready conditions in the County was completed by CTC's Outside Plant (OSP) engineers and involved analyzing a statistically random sample of locations within the county with photometric tools such as Google Earth and Google Maps to determine the required levels of Make-Ready and network distribution over aerial and underground infrastructure. The results of this analysis suggest a design that is comprised of 75 percent aerial fiber and 25 percent underground fiber, with approximately 3 percent of the poles requiring light or no Make-Ready,

42 percent requiring medium Make-Ready and 30 percent requiring significant or heavy Make-Ready.

The information from Network Analyzer, the Make-Ready assessment, current in-market labor and material costs, and additional necessary information from Geological and topographical datasets, were entered into CTC's proprietary FTTP modelling software and used to generate the estimated CAPEX for the FTTP Infrastructure designs.

5.2 Design 1: FTTP infrastructure design for all households and businesses currently receiving speeds less than 100/100 Mbps

CTC engineers gathered information on physical address locations, ISPs and service availability from the FCC Fabric v2 and Broadband Data Collection (BDC) datasets. They determined from this analysis that 57,626 locations (48,601 households and 9,025 businesses, government buildings and mixed-use properties) are receiving internet from non-fiber technologies at speeds less than 100/100 Mbps and will be passed by the design.

Secure County facilities such as courthouses and fire stations were selected to host the core equipment of the FTTP network. The facilities are strategically distributed across six geographic areas within the County to optimize the network and provide additional resilience. Table 16 details the core sites and the passings (households and businesses) per site and Figures 48 and 49 depict the hub sites, backbone fiber, primary fiber routes and connected locations.

Table 16: FTTP Hub locations for FTTP design to reach 57,626 households and businesses

Name	Address	Area	Households	No. of passings
Santa Cruz Fire Department Station 2	1103 Soquel Ave, Santa Cruz, CA 95062	Santa Cruz	10,935	12,481
CAL FIRE CZU Station #41	120 Eureka Canyon Rd, Watsonville, CA 95076	Corralitos	8,554	9,937
CAL FIRE CZU Station #33	298 Swanton Rd, Davenport, CA 95017	Davenport	5,933	7,314
Scotts Valley Fire District	251 Glenwood Dr, Scotts Valley, CA 95066	Scotts Valley	11,002	13,286
Superior Court of California County of Santa Cruz	1 2nd St Watsonville, CA 95076	Watsonville	8,663	10,063
Santa Cruz County Fire Station 29	18269 Las Cumbres Rd, Los Gatos, CA 95033	San Lorenzo	3,514	4,545
Total		**48,601**		**57,626**

Figure 48: FTTP hub sites and fiber backbone route for locations currently receiving less than 100/100 Mbps speeds

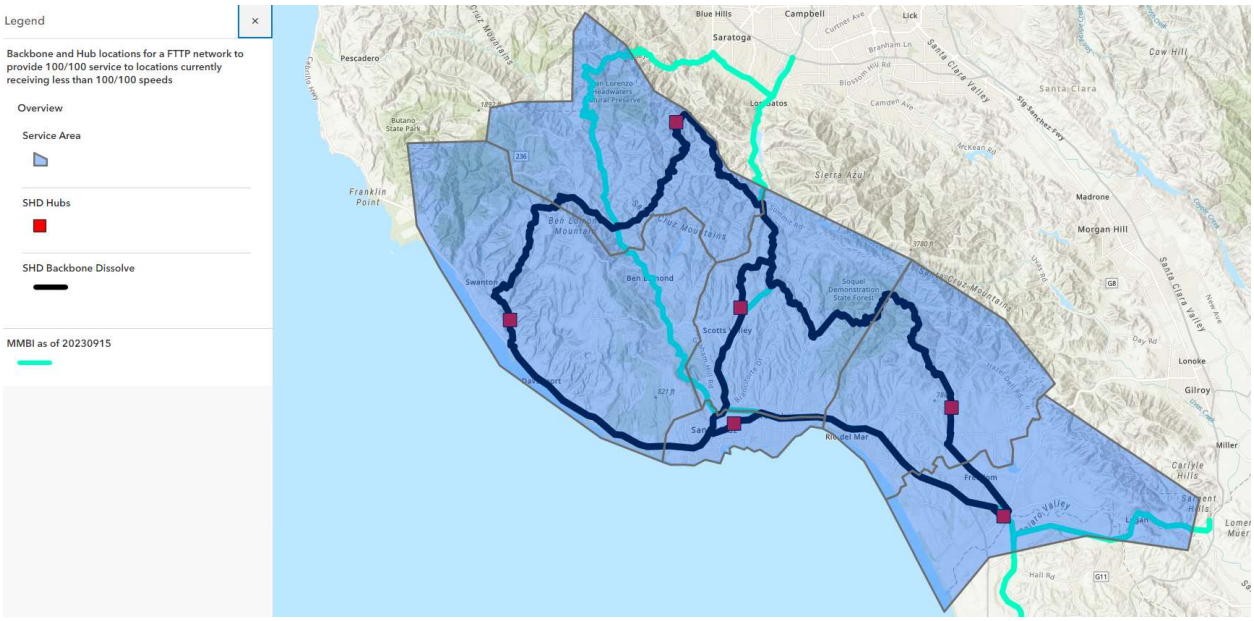
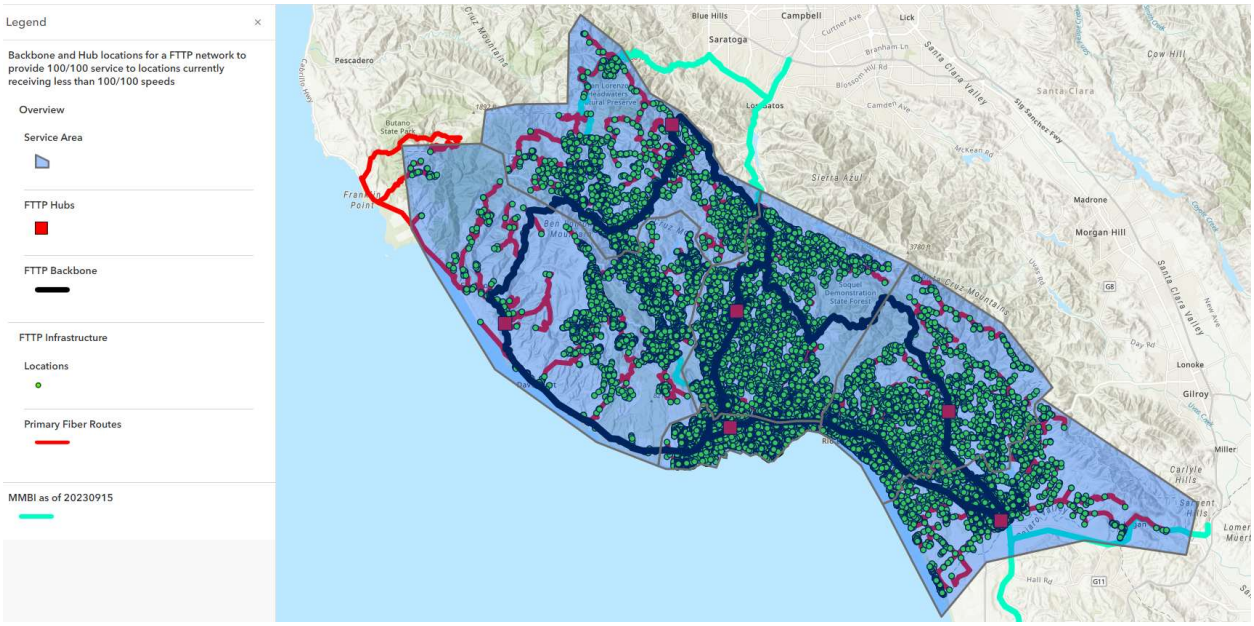


Figure 49: FTTP fiber routes and 57,626 connected locations



5.2.1 The estimated CAPEX for an FTTP infrastructure that will connect all locations currently receiving speeds less than 100/100 Mbps is $536.7 million

Our analysis has determined a CAPEX investment of approximately $536.7 million, as summarized in Table 17, will be required to build a FTTP infrastructure for 57,626 households and businesses currently receiving less than 100/100 Mbps speeds in Santa Cruz County.

Table 17: Estimated FTTP infrastructure CAPEX

Infrastructure CAPEX component	Cost	Notes
Project management	$6,150,000	Assumes a 4-person PM team for 5 years
Engineering and as-builts	$21,950,000	Based on $1.5 per foot underground and $2.0 per foot aerial)
Backbone and distribution plant	$423,800,000	
Total infrastructure	**$451,900,000**	**57,626 locations, $7,841.95 per passing**
Contingency	$84,800,000	20% on OSP Labor and Materials only
Total infrastructure cost with contingency	**$536,700,000**	**57,626 locations, $9,313.50 per passing**

5.2.2 Using a conservative take rate of 35 percent (20,169 locations), the estimated implementation cost is $558.4 million

Using a conservative subscriber take rate of 35 percent of the 57,626 passed households and businesses (20,169 locations), the calculations estimate a subscriber CAPEX of approximately $21.7 million (Table 18).

Table 18: Estimated subscriber CAPEX using a conservative take rate of 35 percent

Subscriber CAPEX component	Cost	Notes
FTTP distribution network electronics	$4,050,000	$200.80 per customer
Subscriber drop costs	$8,200,000	$406.56 per customer
FTTP customer premise equipment	$9,450,000	$469.00 per customer
Total subscriber CAPEX	**$21,700,000**	**$1,076.36 per customer**

Adding the total infrastructure cost with contingency to the total subscriber CAPEX, this results in an estimate project implementation cost of $558.4 million to connect 20,169 households and businesses (Table 19).

Table 19: Estimated implementation cost using a conservative take rate of 35 percent

Category	Cost	Notes
Total implementation costs (no contingency)	$473,600,000	$23,481.46 per customer
Total implementation costs (with contingency)	**$558,400,000**	**$27,685.92 per customer**

5.3 Design 2: FTTP infrastructure design for all households and businesses currently receiving speeds less than 100/20 Mbps

CTC engineers gathered information on physical address locations, ISPs and service availability from the FCC Fabric V2 and BDC datasets. They determined from this analysis that 3,974

households and businesses are receiving internet from non-fiber technologies at speeds less than 100/20 Mbps and will be passed by the design.

Secure county facilities such as courthouses and fire stations were selected to host the core equipment of the FTTP network. The facilities are strategically distributed within the County to optimize the network and provide additional resilience. Table 20 details the core sites and the passings (households and businesses) per site and Figures 50 and 51 the hub sites, backbone fiber, primary fiber routes and connected locations.

Table 20: FTTP hub locations

Name	Address	Area	No. of passings
CAL FIRE CZU Station #41	120 Eureka Canyon Rd, Watsonville, CA 95076	Corralitos	1,255
CA Forestry & Fire Protection	13575 Empire Grade, Santa Cruz, CA 95060	Santa Cruz	1,157
Scotts Valley Fire District	251 Glenwood Dr, Scotts Valley, CA 95066	Scotts Valley	1,562
		Total	**3,974**

Figure 50: FTTP hub sites and fiber backbone route for locations currently receiving speeds less than 100/20 Mbps speeds

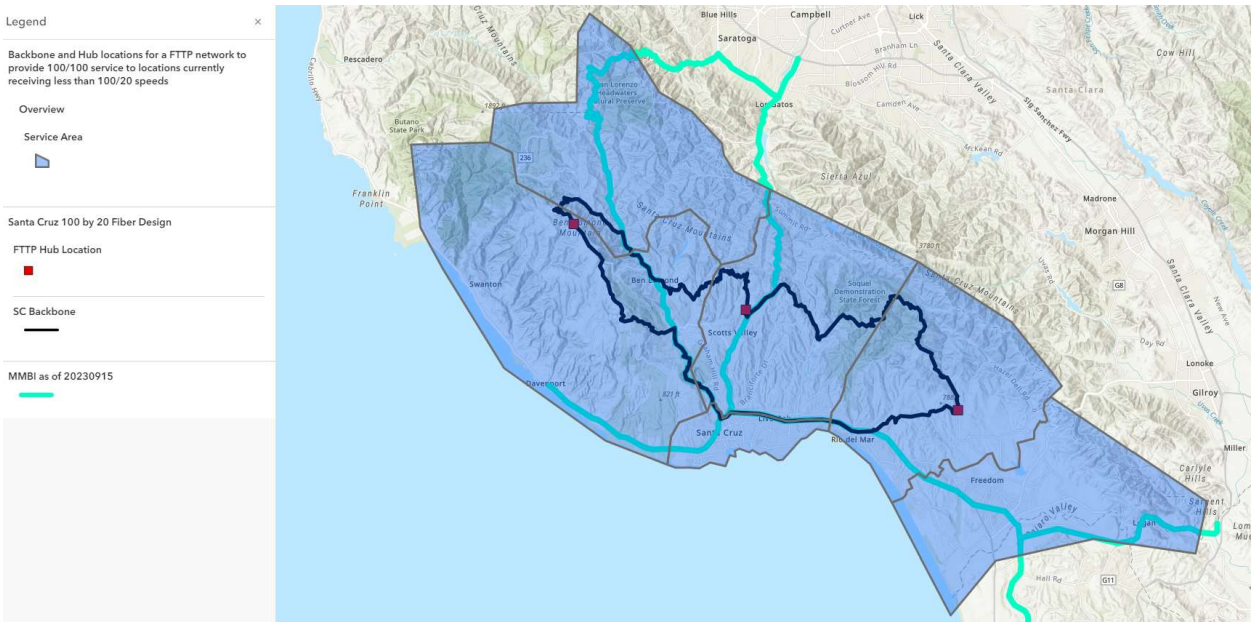
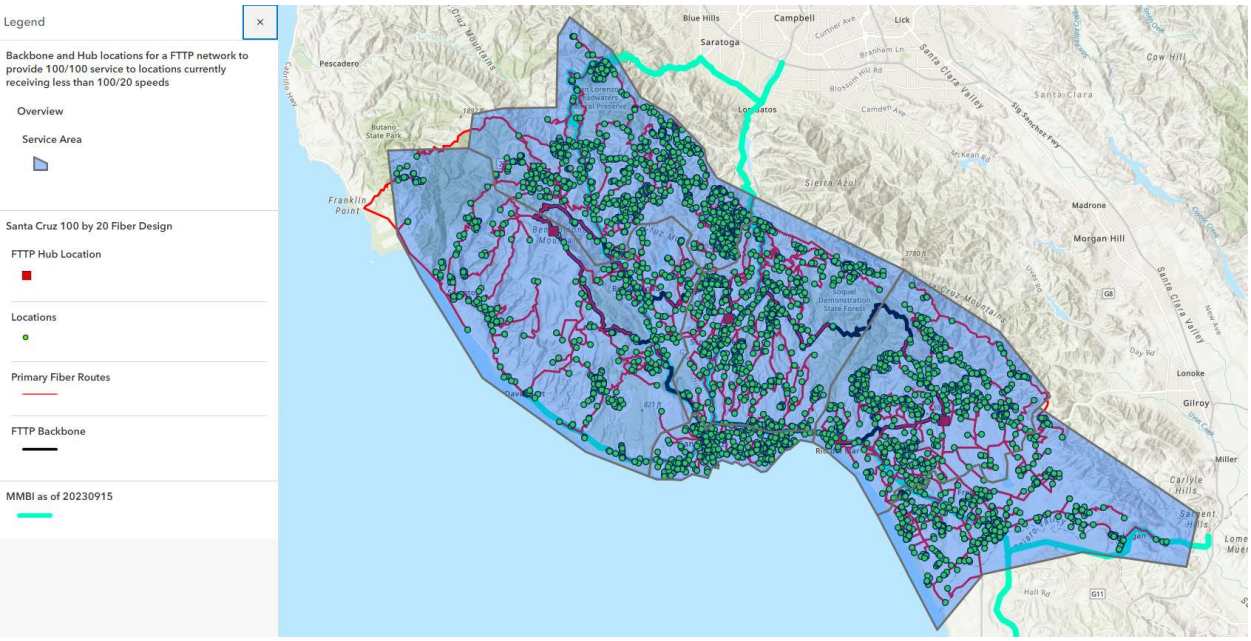


Figure 51: FTTP fiber routes and 3,974 connected locations



5.3.1 The estimated CAPEX for an FTTP infrastructure that will connect all locations currently receiving speeds less than 100/20 Mbps is $296.8 million

Our analysis has determined a CAPEX investment of approximately $296.8 million, as summarized in Table 21, will be required to build a FTTP infrastructure for 3,974 households and businesses currently receiving less than 100/20 Mbps speeds in Santa Cruz County.

Table 21: Estimated FTTP infrastructure CAPEX

Infrastructure CAPEX component	Cost	Notes
Project management	$450,000	Assumes a 1-person PM team for 1.5 years
Engineering and as-builts	$12,800,000	Based on $1.5 per foot underground and $2.0 per foot aerial)
Backbone and distribution plant	236,250,000	
Total infrastructure	**$249,500,000**	**3,974 locations, $62,783.09 per passing**
Contingency	$47,300,000	20% on OSP labor and materials only
Total infrastructure Cost with contingency	**$296,800,000**	**3,974 locations, $74,685.46 per passing**

5.3.2 Using a conservative take rate of 35 percent (1,391 locations), the estimated implementation cost is $298.8 million

Using a conservative subscriber take rate of 35 percent of the 3,974 passed households and businesses (1,391 locations), the calculations estimate a subscriber CAPEX of approximately $2 million (Table 22).

Table 22: Estimated subscriber CAPEX using a conservative take rate of 35 percent

Subscriber CAPEX component	Cost	Notes
FTTP distribution network electronics	$300,000	$215.69 per customer
Subscriber drop costs	$1,050,000	$754.91 per customer
FTTP customer premise equipment	$650,000	$469.00 per customer
Total subscriber CAPEX	**$2,000,000**	**$1,439.60 per customer**

Adding the total infrastructure cost with contingency to the total subscriber CAPEX, this results in an estimated project implementation cost to connect 1,391 households and businesses of $298.8 million (Table 23).

Table 23: Estimated implementation cost using a conservative take rate of 35 percent

Category	Cost	Notes
Total implementation costs (no contingency)	$251,500,000	$180,818.18 per customer
Total implementation costs (with contingency)	**$298,800,000**	**$214,824.93 per customer**

5.4 Design 3: Fixed Wireless Access (FWA) infrastructure design to 49,266 households and businesses currently receiving speeds less than 100/100 Mbps (including 2,789 receiving less than 100/20 Mbps speeds)

To design the FWA network, CTC engineers gathered information from the Ookla Tower source dataset regarding tower sites in or close to Santa Cruz County. Address locations, ISPs and service availability were provided by the FCC Fabric V2 and BDC datasets[41].

The key objectives and common wireless network design assumptions for the design are described below and include:

- Where fiber is not available at the selected tower site, use wireless backhaul to an adjacent site that provides adequate capacity and speeds.

[41] Datasets used for the analysis were FCC Fabric V2 (Dec 31, 2022) updated BDC Aug 16, 2023

- Use commercially-off-the-shelf (COTS) next generation fixed wireless technology that will provide higher speeds and wider coverage than LTE-based wireless systems.
- Use licensed 3.65 GHz CBRS GAA spectrum to avoid frequency interference.[42]
- Use a point-to-multipoint topology for maximum speed and reliability.
- Design to provide consistent capacity and highly available service
- Provide 100/100 Mbps service to as many locations as possible within the coverage footprint
- Provide 100/100 service to as many locations as possible that are not receiving 100/20 Mbps speeds in the coverage footprint

Recent breakthroughs in wireless and antenna technologies have enabled wireless equipment manufacturers to create off-the-shelf next generation fixed wireless access technology (ngFWA) solutions that can provide served speeds over large areas and significant distances. One of these companies, Tarana Wireless, is considered a leader in the industry, and has successfully completed significant wireless deployments worldwide using its ngFWA range of products.

The Tarana Wireless G1 platform offers all the rapid deployment advantages of fixed wireless and the performance, capacity, and interference-rejection required to deliver reliable fixed broadband connections for homes and businesses at a large scale in challenging non-line-of-sight conditions. It is a wireless alternative to last-mile fiber or cable infrastructure.

The Tarana Wireless G1 ngFWA solution has been used to model the coverage footprint and all associated CAPEX for our fixed wireless infrastructure model to provide 100/100 Mbps service to households and businesses in Santa Cruz County receiving internet service speeds that are less than 100/100 Mbps.

5.4.1 Fixed Wireless Access infrastructure coverage area

The coverage area for any wireless network is determined by the spectrum, technology, RF power, receiver gain, equipment, antenna pattern, antenna physical configuration, and clutter. Capacity in a wireless network, or number of users with suitable service, is primarily limited by the bandwidth of the spectrum in use.

[42] The CBRS 3550-3700 MHz spectrum is tightly regulated by FCC approved Spectrum Access System (SAS) Administrators that include Google, Sony, CommScope and others, to mitigate interference between users of the spectrum. Environmental Sensing Capabilities (ESCs) and Dynamic Protection Areas (DPAs) have been agreed upon between the US DoD and the FCC to ensure interrupted operation of any US DoD radar systems within the CBRS spectrum. There are no current DPA's in the vicinity of Santa Cruz County that will affect normal operation of the CBRS spectrum.

Using common wireless network design assumptions, the Longley-Rice type propagation model with 33-foot resolution and the following parameters to simulate a "real-world" scenario, analysis and calculation can estimate the number of addresses within the coverage range of the selected tower sites that could be served with 100/100 Mbps, total system coverage, and end user throughput.

Key tower site equipment parameters:

- A 34-tower site design using existing towers
- Two 40 MHz lightly licensed 3.65 GHz CBRS channels
- Tarana Wireless G1 equipment
- Up to four-massively multiple-input multiple-output (MIMO) sector antennas at each site,[43] tilted down as specified by the coverage modelling tool
- Configuration parameters that represent the technology being modeled
- EIRP (signal level) that compensates for other users on the spectrum

The results of our wireless modelling indicate the footprint of this design reaches over 70,000 locations and provides 100/100 Mbps service to 49,266 (approximately 85 percent) of the 57,626 households and businesses in the county current receiving speeds less than 100/100 Mbps. The distribution of service levels is provided in Table 24.

Table 24: Summary of current service levels and estimated total wireless coverage with proposed FWA infrastructure

Current reported FCC BDC speeds (Mbps)[44]	County locations	Locations reached with 100/100 Mbps service by the design	% reached by the design
100/100 or Greater	22,433	21,469	96%
Locations currently with less than 100/100 speeds	57,626	49,266	85%
Totals	**80,061**	**70,735**	**88%**
Distribution of speeds less than 100/100 Mbps and locations covered			
100/20 to 100/100	53,654	46,477	87%
25/3 to 100/20	246	214	87%
Under 25/3	3,728	2,575	69%

[43] Santa Cruz County has irregular terrain and some tower sites are located on hilltops. Each site's sector configuration is engineered to optimize coverage. Some sites have less than four sectors as there is enough terrain blockage not to warrant 360-degree coverage.
[44] FCC Fabric V2 (Dec 31, 2022) updated BDC Aug 16, 2023

The 34 tower sites used in the wireless design are displayed in Figure 52, and the locations of the 49,266 households and businesses that will receive 100/100 Mbps service using the design, are displayed in Figure 53.

Figure 52: Fixed wireless design - tower sites

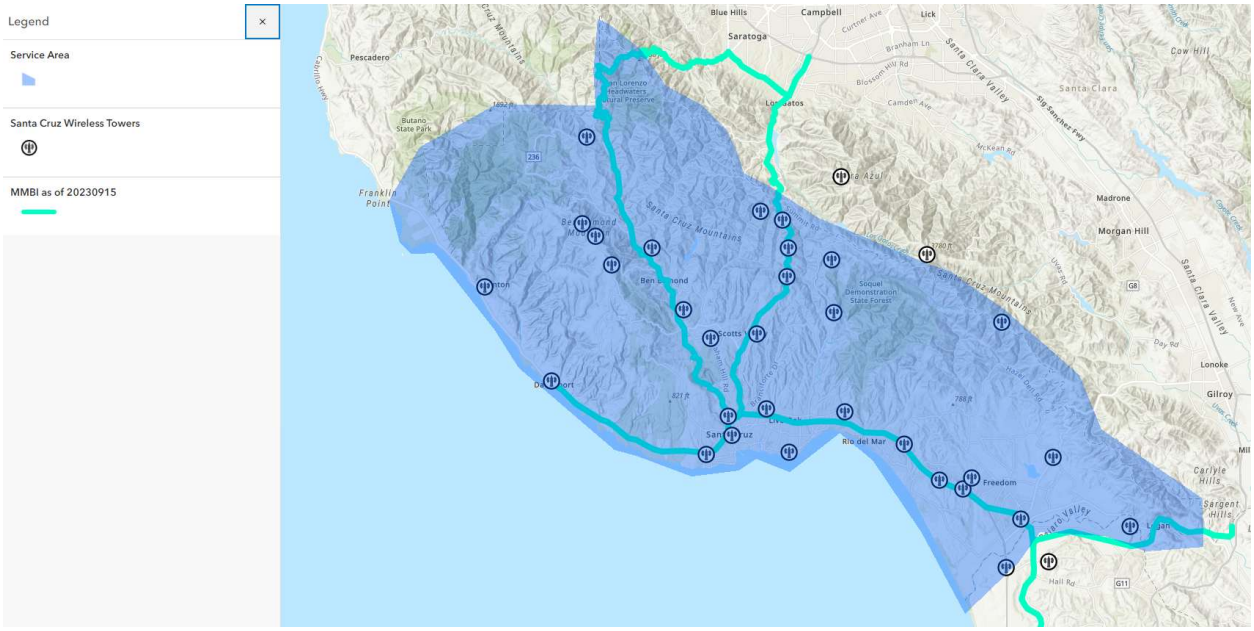
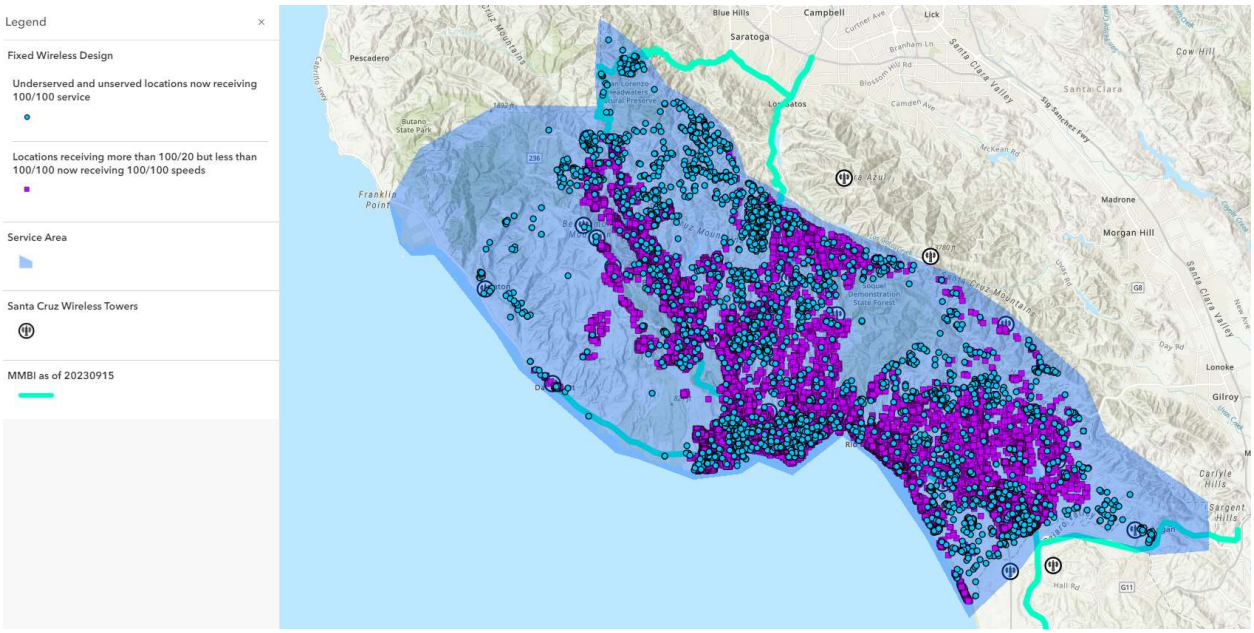
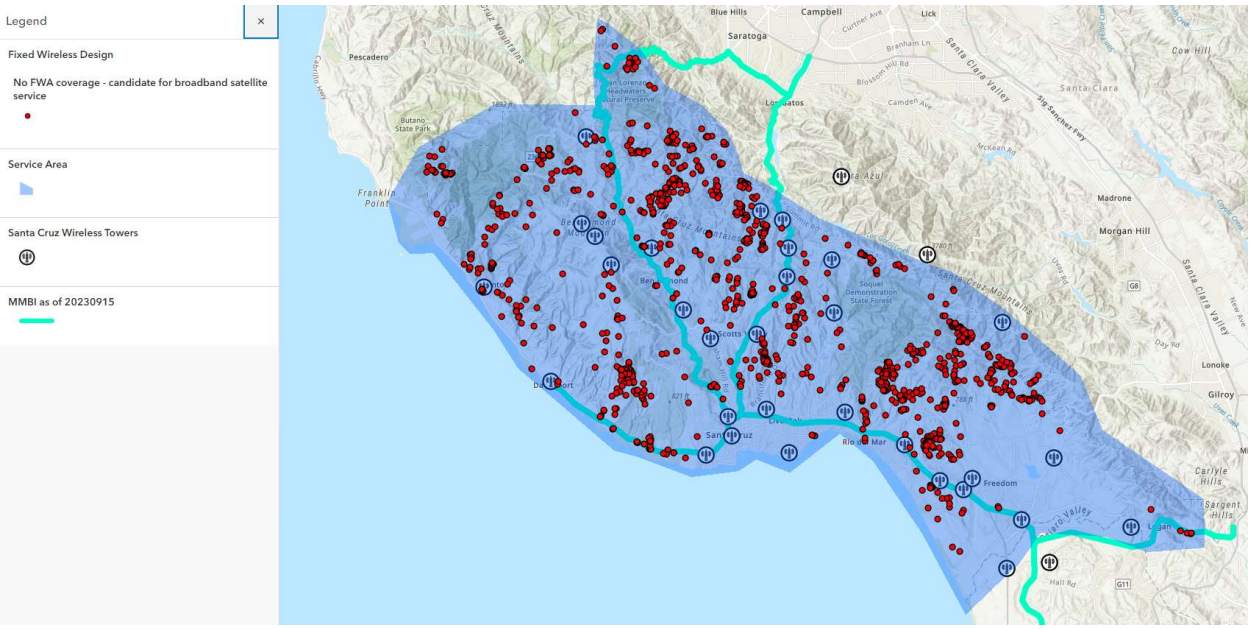


Figure 53: Fixed wireless design – 49,266 locations reachable with 100/100 speeds



Approximately 1,101 of the 3,974 locations receiving less than 100/20 speeds are scattered throughout the County and cannot be reached using this design. An alternative technology such as satellite broadband Internet is recommended to provide served broadband speeds to these locations. Figure 54 displays these locations.

Figure 54: Candidates for satellite internet – locations not reachable by the fixed wireless design



5.4.2 The estimated CAPEX for a FWA infrastructure that will connect 49,266 of the 57,626 all locations currently receiving speeds less than 100/20 Mbps is $4.4 million

Our modelling has determined that a CAPEX investment of approximately $4.4 million, as summarized in Table 25, will be required to provide a licensed fixed wireless infrastructure solution for 49,266 (approximately 85 percent) of the 57,626 households and businesses currently receiving less than 100/100 Mbps speeds in Santa Cruz County.

Table 25: Total estimated FWA infrastructure CAPEX

CAPEX component	Cost	Cost per subscriber	Cost per site
Base station RAN hardware costs	$2,069,512	$120	$60,868
Wireless backhaul	$484,500	$28	$14,250
Installation cost	$1,020,000	$59	$30,000
Design cost	$135,538	$8	$3,986
Total infrastructure cost for 49,266 locations	**$3,709,550**	**$215**	**$109,104**
Contingency (20% on wireless infrastructure equipment and installation costs)	$714,802	$42	$21,821
Total infrastructure cost (with contingency)	**$4,424,352**	**$257**	**$130,925**

5.4.3 Using a conservative take rate of 35 percent (17,243 locations), the estimated implementation cost is $26.2 million

Using a conservative subscriber take rate of 35 percent of the passed households and businesses (17,243 locations), the calculations estimate a subscriber CAPEX of approximately $21.8 million and a total project implementation cost of $26.2 million (Table 26).

Table 26: Total estimated FWA implementation CAPEX, with a take rate of 35 percent and 17,243 passings

CAPEX component	Cost	Cost per subscriber	Cost per site
Subscriber costs per engagement (CPE) costs (electronics)	$14,898,038	$864	$438,178
Subscriber CPE costs (installation)	$6,897,240	$400	$202,860
Total CPE costs	**$21,795,278**	**$1,264**	**$641,038**
Total infrastructure cost for 49,266 locations	$3,709,550	$215	$109,104
Total CPE costs	$21,795,278	$1,264	$641,038
Total implementation cost	**$25,504,828**	**$1,479**	**$750,142**
Contingency (20% on wireless infrastructure equipment and Installation costs)	$714,802	$42	$21,821
Total implementation cost (with contingency)	**$26,219,630**	**$1,521**	**$771,963**

5.5 OPEX considerations for the FTTP and FWA infrastructure designs

OPEX consists of three broad categories: 1) labor costs (salary and benefits for the staff required to operate the network), 2) parametric non-labor costs (calculated from specific network parameters), and 3) other non-labor costs (other fixed costs necessary to operate the network).

Labor is the largest OPEX component, especially during the early years of network operations, because there is a steeper ramp-up curve in the earlier years of operation and because a significant portion of the OPEX is determined by the number of network subscribers.

Technology replacement timelines are significantly different for the infrastructure designs. Industry trends have shown that wireless technology advancements in signal propagation, data compression and overall network speeds and capacities demand that ISPs refresh their technology, on average, every seven years. Fiber deployments, however, have a significantly longer refresh cycle that is dictated by advances in optic capacity and electronics, as physical fiber is expected to survive for more than 50 years. A refresh cycle of 10 years on average is anticipated to be applied to the network electronics. Tower site leases and electronic replacement or refresh are included in the calculations.

5.5.1 Estimated OPEX for Design 1 (FTTP implementation to connect 20,169 locations currently receiving speeds less than 100/100 Mbps service)

Based upon a CAPEX of $536.7 million for a FTTP infrastructure for 57,626 locations currently receiving speeds less than 100/100 Mbps and a conservative take rate of 35 percent (20,169 passings), the annual OPEX for this infrastructure is estimated at $20.2 million.

5.5.2 Estimated OPEX for Design 2 (FTTP implementation to connect 1,361 locations currently receiving speeds less than 100/20 Mbps service)

Based upon a CAPEX of $296.8 million for a FTTP infrastructure for 3,974 locations currently receiving speeds less than 100/20 Mbps and a conservative take rate of 35 percent (1,361 passings), the annual OPEX for this infrastructure is estimated at $8 million.

5.5.3 Estimated OPEX for Design 3 (FWA infrastructure design to connect 17,243 locations currently receiving speeds less than 100/100 Mbps, including 2,789 locations currently receiving speeds less than 100/20 Mbps)

Based upon a CAPEX of $26.2 million for the Fixed Wireless Access Infrastructure and 17,243 passings (35 percent take rate), the annual OPEX for this infrastructure is estimated at $9.2 million.

6 Funding opportunities include FFA, CASF and BEAD for infrastructure deployment

CTC explored opportunities for the County to participate in the Federal Funding Account (FFA) and the California Advanced Services grant programs offered by the California Public Utilities Commission (CPUC). The FFA application window opened on June 30, 2023, and closed on September 29, 2023. The CASF application window for the Broadband Infrastructure Account closed in June 2023 with another potential short round scheduled at the end of the year. The CPUC's implementation of the federal BEAD infrastructure grant funding program will be over the course of the next two years and may provide some opportunities for additional funding in the County, but the program parameters have not been completed or defined to date.

6.1 Considerations for Santa Cruz County in the context of state and federal infrastructure funding

For Santa Cruz County to take full advantage of anticipated funding opportunities, the County must consider the following questions for each potential funding opportunity:

- Does the County have sufficient time and resources to secure agreements with potential partners? This would include any County-required procurement or council approval process necessary for selecting a partner.
- Are the grant evaluation criteria and related County-driven partner selection criteria in alignment with County objectives and has the County clearly identified such objectives relative to technology, affordability, prioritization of areas, speed of deployment, service level commitments, ownership of infrastructure, and any other enforceable commitments from the potential partner?
- Are there opportunity costs associated with *not* pursuing these grant opportunities – in particular, do the eligible areas include locations that are unique to these grant opportunities and potentially would not be made available in future grant opportunities?
- Will the potential projects be technically and financially viable, and/or what analysis and data is required to establish viability of projects against the grant opportunities?
- Considering the amount of grant funds made available, possible interested parties and potential partners, and the available resources and expertise to execute a grant, is there sufficient prospect for success and/or are there opportunity costs associated with unsuccessful grants that should be weighed against pursuing these grant opportunities?
- What will the impact of realigning resources to take advantage of these opportunities be on the larger project scope and deliverables for the County's broadband strategic plan?

Based on research to date, analysis of stakeholder interviews, and work with GIS mapping data, the County's best path forward would be to leverage projects that ISPs identify and pursue in funding opportunities through the FFA, CASF and BEAD programs rather than having the County apply for these programs. It seems unlikely that the County will have the necessary resources, approvals, and planning lined up to move forward independently and directly as an applicant for current or future rounds of CPUC funding; however, it is important to garner funding as it becomes available through each program. The County should continue to seek out targeted partnerships and specific projects that will benefit the broadest number of residents while supporting identified ISP projects to successfully extend last-mile infrastructure in the County.

As discussed below, the County has several ways in which it can structure meaningful and effective partnerships with ISPs that may increase the chances of funding and also allow the County to participate in a resource-appropriate manner. CTC also recommends that the County ensure that its long-term broadband, digital equity, and economic development goals and planning are a part of the decision-making process as it identifies potential partnerships and project opportunities for CPUC funding opportunities.

6.2 Federal Funding Account (FFA)

The California State Legislature has allocated $2 billion to a new last-mile federal funding program ("Federal Funding Account Program"), to be split evenly between rural and urban areas and to be administered by the CPUC.[45] As part of its statutory mandate, the CPUC designated counties as urban or rural based on a formula that uses 2019 service availability data.[46] Using this formula, the CPUC has categorized Santa Cruz County as an urban county and set aside $10.3 million under FFA to fund broadband infrastructure projects located in the County. The CPUC accepted applications for this program until the end of September 2023. Last-mile projects must be completed within two years of receiving authorization to construct.

Other key elements of the program include:

- **Eligible organizations:** Broadband service providers, local governments, electric utilities, nonprofits, cooperatives, and Tribal governments may apply. The CPUC intends to prioritize requests from local governments, nonprofits, and cooperatives, with the

[45] SB 4, Chapter 671 (October 8, 2021), Section 2 (revised Public Utilities Code Section 281(n)), https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=202120220SB4 (accessed April 13, 2022). The funding is mostly federal funding from the American Rescue Plan Act, including both Capital Projects Fund and State and Local Fiscal Recovery Funds, as well as smaller contributions of state funds.

[46] Public Utilities Commission of the State of California, "Decision Adopting Federal Funding Account Rules," (D.22-04-055), Order Instituting Rulemaking Regarding Broadband Infrastructure Deployment and to Support Service Providers in the State of California, Rulemaking 20-09-001, April 22, 2022, pp. 32-35 ("FFA Decision"), https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M470/K543/470543650.PDF.

assumption that these networks have less pressure to generate profits and a stronger commitment to serve communities.

- **Eligible areas:** The FFA program determines eligibility based on the current performance of broadband service options in an area, and allows further prioritization based on other key digital equity factors. Non-contiguous projects may be submitted as a single project.
    - **General eligibility:** Applicants can apply for projects in areas that are "unserved" at less than 25/3 Mbps through a reliable wireline connection, defined as FTTP or using DOCSIS 3.0 or greater technology. An applicant can include locations that show as "served" on the availability map if the applicant can demonstrate that service in those locations is "unreliable."[47]
    - **Legacy technologies can be assumed to be unserved:** The CPUC has adopted a "rebuttable presumption" that specifies that areas with only copper facilities, fixed wireless, or cable system technology of DOCSIS 2.0 or lower are designated as "unserved" and eligible for funding. Incumbent ISPs and network owners will be allowed to rebut this assumption by showing that the network in question offers reliable service to all locations of at least 25/3 Mbps;[48] these data from ISPs, however, would not bar an application for funding in this area. The area would still be considered "underserved" if the incumbent cannot demonstrate service offerings of 100/20 Mbps.[49]
    - **Prioritization:** The CPUC will award up to 20 points to applicants proposing to serve areas that meet certain socioeconomic indicators.[50] These indicators include:[51]
        - The Disadvantaged Households Index in CalEnviroScreen developed by the California Office of Environmental Health Hazard Assessment: 25 percent

[47] See, FFA Decision, pp. 20-21 (this could include challenging a fixed wireless provider's performance claims of its infrastructure).
[48] See, FFA Decision, p. 20. Note that this is a broader definition of "unserved" than the FCC applies to its National Broadband Map, resulting in discrepancies between the number of unserved locations as per the FFA's definition and the FCC's mapping.
[49] See, FFA Decision, Appendix A, p. A-21-22.
[50] See, FFA Decision, at page 20; Appendix A, page A-7.
[51] CPUC, "Frequently Asked Questions: CPUC Federal Funding Account, Last Mile," April 2023, pp. 4-5, https://www.cpuc.ca.gov/-/media/CPUC%20Website/Files/uploadedFiles/CPUC_Public_Website/Content/Utilities_and_Industries/Communications_-_Telecommunications_and_Broadband/FFA%20Webpage%202023-04/FFA%20FAQs%20V2.pdf.

of the highest scoring census tracts qualify as a Disadvantaged Community,[52] or

- Census Bureau Median Household Income data: areas with median household income at less than 80 percent of the county median household income are classified as low-income communities

- **Network buildout requirements:** Funded projects must reliably provide wireline service speeds of 100 Mbps symmetrical, have a latency under 100 milliseconds, and must offer services with at least 1,000 GB of data a month (with strong preference for unlimited data). Fiber projects are prioritized. Applicants can include a proposal to build middle-mile infrastructure if demonstrated to be necessary to achieve last-mile connectivity. Funded middle-mile projects must be open access with multiple interconnection points. Projects must be complete within 24 months after authorization to build.

- **Service offering requirements:** Projects must cap prices for five years after project completion at the rates proposed in the application and must waive installation charges. Only adjustments of rates in accordance with the Consumer Price Index are allowed. Applicants must participate in the ACP or other analogous low-income subsidies for service.

- **Grant administration:** There are significant quarterly and annual reporting requirements regarding project progress, financial status, and subscriptions; post-closeout reporting will also be required. Payment will be issued upon percentage completion of milestones (10 percent, 35 percent, 60 percent, 85 percent, 100 percent).

- **Scoring Criteria:** Applicants can receive additional scoring priority by meeting these optional elements:

  - **Match (up to 10 points):** A match is not required, but a larger match or matches from diverse sources will provide additional points.

  - **Low-cost broadband service offering (up to 20 points):** "Low-cost" is defined as no more than $40 per month for 50/20 Mbps.

  - **Fiber (up to 10 points)**

    - Strong preference for all fiber projects

[52] California Office of Environmental Health Hazard Assessment, "CalEnviroScreen 4.0," https://oehha.ca.gov/calenviroscreen/report/calenviroscreen-40.

        - Applicants can justify the use of a different wireline technology with additional evidence and documentation that fiber is infeasible.

    - **Projects serving disadvantaged communities (up to 20 points):** Will identify "disadvantaged communities" with different socioeconomic indicators that appear on the Federal Funding Account Map.

    - **Partnership with public, nonprofit, or Tribal entities (up to 20 points)**

        - Networks "owned, operated by or affiliated with" a Tribe, local government, or nonprofit will receive additional points

        - Letters of support from public agencies will provide some additional points

    - **Financial, technical, operational capacity (up to 10 points):** Applicants must provide three years of financial statements and five years of pro forma forecasts.

    - **Participation in the federal and/or state Lifeline programs (up to 10 points)**

    - **Application with well-planned project/reasonable budget (up to 10 points):** Applicants must provide a five-year business plan to demonstrate project viability.

    - **Price freeze for up to 10 years (up to 10 points):** Price freeze of rates for a minimum of five years is required; longer freeze will provide additional points.

    - **Leveraging statewide middle-mile (up to 10 points)**

6.3 CPUC Broadband Caseworker Training

As discussed above, the CPUC's Federal Funding Account explicitly prioritizes applications that propose to build networks "owned, operated by, or affiliated with a local government, Tribe or nonprofit." To encourage and support applications from these types of entities, the CPUC has created a Broadband Caseworker program.[53] The program is designed to educate local entities about broadband technologies, network planning, business planning, and market structure.

The program includes both in-person seminars and a series of online webinars posted to the CPUC website. These materials are intended to support local governments that may be interested in applying for the Federal Funding Account. In addition to the seminars, the program provides links to data and mapping resources, third-party broadband planning resources, and descriptions

[53] CPUC, "Broadband Internet Caseworkers," https://www.cpuc.ca.gov/industries-and-topics/internet-and-phone/broadband-implementation-for-california/broadband-caseworkers.

of different funding programs. Local governments can request a one-on-one conversation with a broadband caseworker to get started. The CPUC plans to frequently update and add to this resource.

6.4 California Advanced Services Fund (CASF)

The California Advanced Services Fund (CASF) Infrastructure Account has been the cornerstone of the CASF program, funding hundreds of millions of dollars in last-mile infrastructure deployment projects throughout the state.[54] The CASF program also includes the following programs: the Broadband Adoption Account, the Broadband Public Housing Account, the Rural and Urban Regional Broadband Consortia Grant Account, the Line Extension Pilot Program and the Tribal Technical Assistance Program.[55]

The CPUC closed the application window for the infrastructure grant program in June 2023 and projects must be complete within two years of final environmental review or 18 months of a determination that the project will be exempt from environmental review. If there are additional funds after awards are announced next February, there may be a short second round prior to an entirely new round scheduled for April of 2024.

To be eligible for infrastructure funding, proposed projects must serve "unserved areas" with reported speeds of less than 25/3 Mbps, with priority given to areas that lack 10/1 Mbps service.[56] Areas with service greater than 25/3 are not eligible for CASF funding, unlike the FFA account that funds projects in areas with less than 100/20 Mbps. As discussed below, the CPUC's Broadband Interactive Map has a "CASF Infrastructure Account Eligibility" layer that shows residential broadband serviceable locations that are unserved at broadband speeds of 25/3 Mbps or greater.

CASF proposed projects must provide at least 100/20 Mbps, or the speed standard set by the FCC, whichever is greater at the time of the application. Note that this standard falls below the 100/100 Mbps requirement under the FFA program. The CPUC has placed less emphasis on fiber technology for this program and will consider projects offering fixed wireless or satellite service (within narrow parameters). While there is no specific requirement for matching funds, some projects will not receive full funding to cover all project costs. Funding amounts for each grant will be between 60 percent and 100 percent of total proposed project costs. The level of funding will depend on several factors, including the current level of service availability in the area,

[54] CPUC, "California Advanced Services Fund (CASF)," https://www.cpuc.ca.gov/industries-and-topics/internet-and-phone/california-advanced-services-fund; See, D.22-11-023 (CASF Infrastructure Decision), https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/communications-division/documents/casf-infrastructure-and-market-analysis/2022-infra-account---decisions-and-guidelines/decision-d22-11-023.pdf.
[55] https://www.cpuc.ca.gov/industries-and-topics/internet-and-phone/california-advanced-services-fund
[56] CASF Infrastructure Decision, Attachment 1, A-10-11 (definition of "unserved").

demographics and the socioeconomic profile of the proposed area, terms and conditions of service offerings, and rurality.

All projects must offer a low-income broadband plan for eligible participants, such as the ACP. To receive additional funding priority, grantees may choose to offer a low-cost program for $15 per month. The CPUC's rules also support and encourage applications that propose to leverage other federal and state funding sources such as ReConnect and Rural Digital Opportunity Fund (RDOF).

6.5 BEAD Program

In 2024**,** the CPUC is expected to implement the BEAD Program.[57] This federal program set aside $42.45 billion for broadband infrastructure projects nationwide. NTIA has announced that California will receive $1.86 billion of funding for projects throughout the state.

Federal rules require states to prioritize funding for projects in unserved areas (less than 25/3 Mbps). Only when the state can demonstrate that it has a plan to deploy infrastructure in unserved areas will it be allowed to use any remaining funds for projects in underserved areas (between 25/3 and 100/20 Mbps). BEAD will still prioritize fiber buildouts but may also fund some wireless projects in areas designated as "extremely high cost" under the BEAD rules.

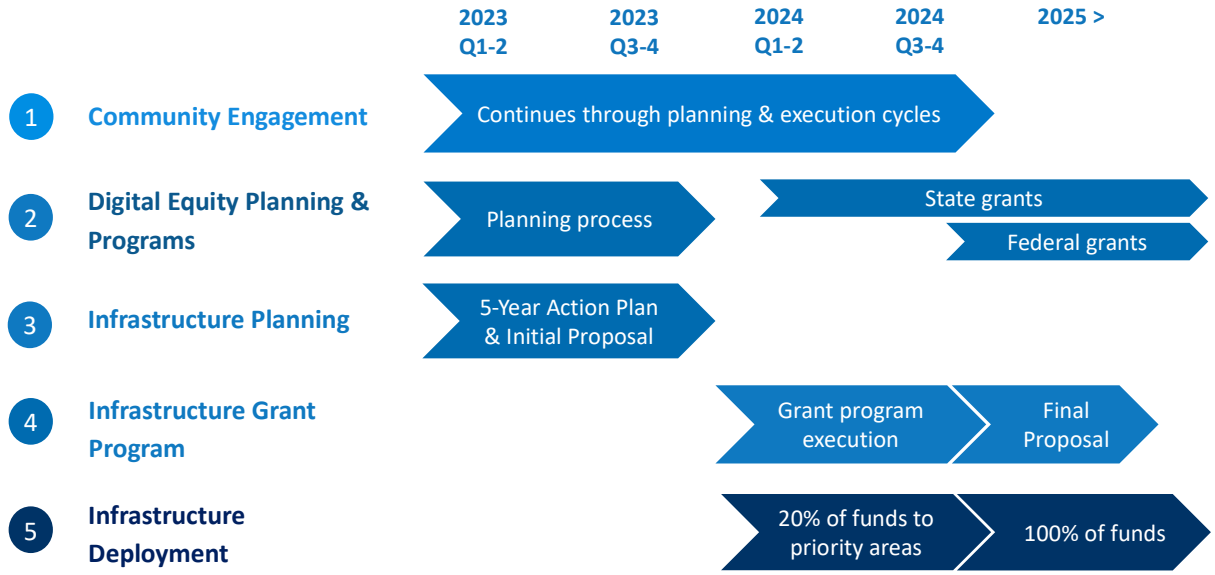
The CPUC is in the process of planning and crafting its BEAD grant design and many details and criteria have yet to be developed. The CPUC expects to release a list of eligible locations for public review and challenge by Q1 2024 and the grant window for BEAD to open at the earliest in Q3 2024.[58]

Below is a timeline of BEAD activities.

[57] CPUC, "California BEAD Program," https://www.cpuc.ca.gov/industries-and-topics/internet-and-phone/broadband-implementation-for-california/bead-program; NTIA, "Broadband Equity, Access, and Deployment Program," https://broadbandusa.ntia.doc.gov/funding-programs/broadband-equity-access-and-deployment-bead-program.

[58] California BEAD Program, About and BEAD Timeline (as of June 27, 2023), https://www.cpuc.ca.gov/industries-and-topics/internet-and-phone/broadband-implementation-for-california/bead-program.

Figure 55: BEAD program timeline



6.6 California mapping resources and data

The CPUC has two different mapping resources. Each serves a different purpose and contain different layers.

6.6.1 California Interactive Broadband Availability Map[59]

The "original" map developed by the CPUC relies on data submitted directly to the CPUC by ISPs through an ongoing data request.[60] There are multiple layers and data elements built into this map. The CPUC uses address-level broadband subscription data submitted by the providers to validate the map's deployment and service availability data, which are also supplied by the providers. The current map shows "served status" data as of December 31, 2021.[61] Users of the map can download data sets and shapefiles from the CPUC website.[62]

This map includes a CASF Infrastructure Account Eligibility layer that shows residential broadband serviceable locations that are unserved at broadband speeds of 25/3 Mbps or greater. For purposes of applying for a CASF Infrastructure Account grant, these locations are considered either "eligible" (with service availability between 10/1 Mbps and 25/3 Mbps) or "priority

[59] CPUC, "California Interactive Broadband Map," https://www.broadbandmap.ca.gov/.
[60] CPUC, "CPUC Annual Collected Broadband Data," https://www.cpuc.ca.gov/industries-and-topics/internet-and-phone/broadband-mapping-program/cpuc-annual-collected-broadband-data.
[61] CPUC, "Project Development Resources- Data and Maps," https://www.cpuc.ca.gov/industries-and-topics/internet-and-phone/california-advanced-services-fund/project-development-resources---data-and-maps.
[62] CPUC, "Project Development Resources- Data and Maps," https://www.cpuc.ca.gov/industries-and-topics/internet-and-phone/california-advanced-services-fund/project-development-resources---data-and-maps; also see: CPUC, "CPUC Annual Collected Broadband Data," https://www.cpuc.ca.gov/industries-and-topics/internet-and-phone/broadband-mapping-program/cpuc-annual-collected-broadband-data.

eligible" (service availability with less than 10/1 Mbps or no access to broadband at all). Therefore, even if a census block shows that it is served by 25/3 Mbps, the location points on the map will show locations where service above 25/3 Mbps may not be available that are eligible for CASF Infrastructure funding.

6.6.2 Federal Funding Account Public Map[63]

This map was developed specifically to support the CPUC's FFA Last Mile grant program.[64] The map relies on data from the FCC's June 2022 Deployment Data that appears on the FCC Broadband Map.[65] The CPUC further validates the FCC Broadband Map data with data provided directly to the CPUC by ISPs.[66] This map uses hexagons (representing an area of approximately one-tenth of a kilometer) that are shaded to indicate the relative number of locations lacking access to wireline service at 25/3 Mbps within that hexagon. The map also provides the number of locations within each census block that are unserved with reported speeds of less than 25/3 Mbps. This map considers any location where there is only "legacy technology" (DSL or cable DOCSIS 2.0 or older) to be "unserved" regardless of the actual speeds experienced at that location. As a result of this broader definition of "unserved locations," the CPUC's FFA Map identifies a larger number of unserved locations than the FCC's National Broadband Map.

This FFA map does not show individual underserved locations or census blocks that are underserved (with reported speeds between 25/3 Mbps and 100/20 Mbps)—a significant omission given that areas eligible for funding under the FFA program include underserved areas. The CPUC does not explain this omission. The California Interactive Broadband Map discussed above displays downstream service availability by census block at any speed; however, areas with service at 25/3 Mbps or greater are shown as "served" regardless of the technologies deployed in the area, including DSL and DOCSIS 2.0, and it has no location-specific data.

The FFA map also has multiple layers that display demographic and socioeconomic indicators at the census tract or census block level. The CPUC will use two of these layers to prioritize applications.

6.7 Grant evaluation criteria

The following are some evaluation criteria for the County in considering these grant opportunities.

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[63] CPUC, "Federal Funding Account," https://federalfundingaccountmap.vetro.io/.
[64] CPUC, "Federal Funding Account," https://federalfundingaccountmap.vetro.io/map#5.65/37.393/-116.87
[65] Federal Communications Commission, "Broadband Data Collection," https://www.fcc.gov/BroadbandData.
[66] CPUC, "Frequently Asked Questions: CPUC Federal Funding Account, Last Mile," April 2023, FAQ no. 12, https://www.cpuc.ca.gov/-/media/CPUC%20Website/Files/uploadedFiles/CPUC_Public_Website/Content/Utilities_and_Industries/Communications_-_Telecommunications_and_Broadband/FFA%20Webpage%202023-04/FFA%20FAQs%20V2.pdf.

6.7.1 Priorities and goals

The County has expressed its overall goal as the need to expand reliable and affordable access to high-speed broadband to all households and businesses. However, the County does not have the resources to be the lead applicant for upcoming grant programs. To help accomplish this goal, the County would ideally work with local communities, stakeholders, and partners to take these steps on the path to crafting a grant plan:

- Determine if these unserved and underserved areas suffer from a lack of middle-mile infrastructure, last-mile infrastructure, or both;
- Determine if the County has sufficient infrastructure for its functional needs;
- Determine if the County can provide dark fiber, interconnection, and easement resources to providers and anchor institutions in the area;
- Act as a facilitator and possible catalyst for partnerships and projects among providers, anchor institutions, and other stakeholders to expand broadband access; and
- Gather data on the affordability of service for County residents and the need for digital equity programs in the County.

If there are identifiable potential projects and willing partners who are familiar with the assets and infrastructure in the area, it may be feasible to secure partnerships for specific grant opportunities. This is especially true if the County is comfortable with a partnership where the ISP partner owns and controls the network infrastructure and requests only minimal amounts of County assets and resources to support the project. This does, however, also mean that identifying and moving forward with a partnership and project at this time may make subsequent efforts to create different partnership and project selection criteria more difficult. Preliminary efforts may limit the County's options in the future and commit it to similar business arrangements and partner selection logic for future broadband deployment opportunities.

6.7.2 Mapping data to inform potential last-mile project areas

As part of the Broadband Current State Assessment, CTC examined the latest mapping data from the FCC and its National Broadband Map.[67] This map was released in November 2022 and had been continually updated. It contains information on individual locations where fixed broadband internet service exists or could be installed. To obtain access to the address fabric with specific locations, the County obtained a license from CostQuest.

[67] FCC, "FCC National Broadband Map," https://broadbandmap.fcc.gov/home.

Based on the available data, Santa Cruz County appears to be well covered by services that offer speeds of 25/3 Mbps and 100/20 Mbps. However, data gathered through outreach revealed poor service quality even in areas where providers claim broadband speeds or individual locations that are unserved or underserved that appear to be served at a census block level. More granular address fabric data, combined with service availability data from the providers, help to validate these areas of unserved and underserved locations.

In addition to last-mile mapping efforts, CTC interviews and research identified potential new middle-mile projects that could enhance the value and effectiveness of a last-mile project or could support a small middle-mile project as part of a FFA or CASF grant.[68] If the County wants to incorporate this information to help partners refine and optimize cost proposals and targeted project areas, it will be necessary to gather additional information and analysis of pending middle-mile projects and the state's own open access project as part of the review of any potential FFA and CASF project.

It is also important to analyze the CPUC public mapping information.[69] According to this data as of December 31, 2021, 97.2 percent of households in Santa Cruz County are considered served with a minimum of 25/3 Mbps broadband access. The CPUC also shows that the adoption rate for the same time period is 73.2 percent in the County.[70]

Though the FCC map shows the County as essentially served, the CPUC's Federal Funding Account Map, released May 2, 2023, shows a number of "mass market unserved locations" interspersed throughout the County.

6.7.3 Partnerships for FFA or CASF funding

It is unlikely that the County itself will have the resources or necessary approvals to apply for future funding opportunities. The most likely scenario to take advantage of this funding will be to partner with ISPs that will in turn apply for these grants. The following are some potential partnership scenarios:

- **Facilitation model:** The County could engage in conversations with ISPs who may be willing to initiate projects for FFA or CASF funding. The County could participate by offering letters of support and gathering other letters of support to enable projects to be

[68] For example, both Surfnet and Cruzio discussed pending applications for federal funding for middle-mile projects. The County is also well aware of the state's open access middle-mile project.
[69] CPUC, "State of California Fixed Consumer Broadband Deployment," https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/communications-division/documents/broadband-mapping/docs-uploaded-2023/household-deployment-by-county-as-of-dec-31-2021.pdf.
[70] CPUC, "State of California Fixed Consumer Broadband Adoption," https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/communications-division/documents/broadband-mapping/docs-uploaded-2023/fixed-adoption-by-county-as-of-dec-31-2021.pdf.

realized. In this model, the County works to make investment in deploying a network attractive for companies through lowering costs or increasing revenues. The County has the ability to reduce costs for an ISP by streamlining processes and sharing data and assets. Some examples include:

  - Implementing more efficient permitting processes
  - Streamlining the inspections process
  - Providing access to assets, e.g., fiber, conduit, real estate, and/or vertical assets for placement of wireless facilities
  - Documenting and sharing data regarding County processes and assets
  - Facilitating meetings, data sharing, and potential partnerships with other County agencies

- **Grant model:** In this scenario, the County will apply for the funding and make a grant to the ISP(s), and the ISP(s) will make enforceable commitments to build infrastructure and deliver service. The County may choose to use traditional economic development incentives in place of grants. ISPs will focus on the areas with the highest return on investment (ROI) for buildouts, but the County can make investment in other areas more attractive using grants. In the grant-making process, it is critical to secure enforceable promises from providers for both infrastructure builds as well as service costs to consumers.

- **Investment model:** In this scenario, the County would be the applicant and plan to fund and own the infrastructure built with the grant dollars. The County would then contract out the construction and operation of the network to allow ISPs to offer services to end users. Under most funding programs, these types of projects cannot be a pure "middle-mile" or wholesale scenario but can be a combination of middle-mile and last-mile network build.

- **Hybrid model:** In this scenario, the County would be a "silent partner" in an application submitted by an ISP. This could include providing matching funding that would give the service provider priority points in scoring. It could also include providing County-owned locations for right-of-way or facilities colocation that could be seen as "in-kind" matching. The County could own some of the network and "lease back" to the ISP.

The recommended model for the County at this time is the facilitation model. The most productive opportunity at this time would be to leverage projects that ISPs already have in the pipeline or may be preparing for these funding opportunities, with the County assisting in

activities that will help projects meet the needs of the local community and, in doing so, enable the funding and construction of last-mile infrastructure.

Based on the stakeholder interviews conducted to date and the analysis of CTC's preliminary community market research, two potential partners for the County could be Cruzio or Charter. Cruzio has a close relationship with the County and has applied for grant funding previously. The County may also consider partnering with Charter, which has a history of participating in grant programs with the CPUC and currently serves some of the South County that has been identified by the CPUC, and by our stakeholder interviews and research, as a community in need of broadband investment.

Below are the priority areas as defined by the CPUC FFA map:

Figure 56: CPUC priority areas for Santa Cruz County

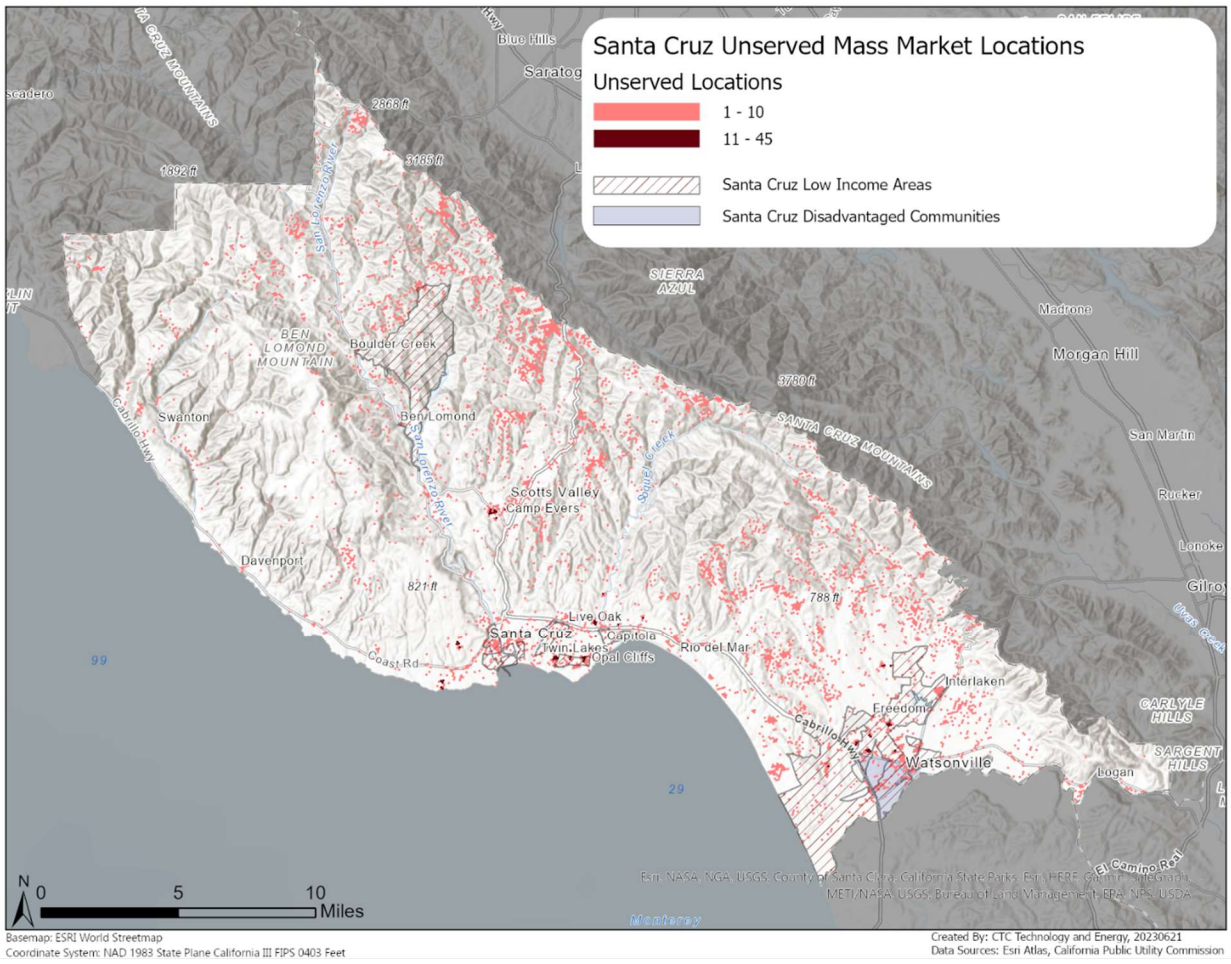
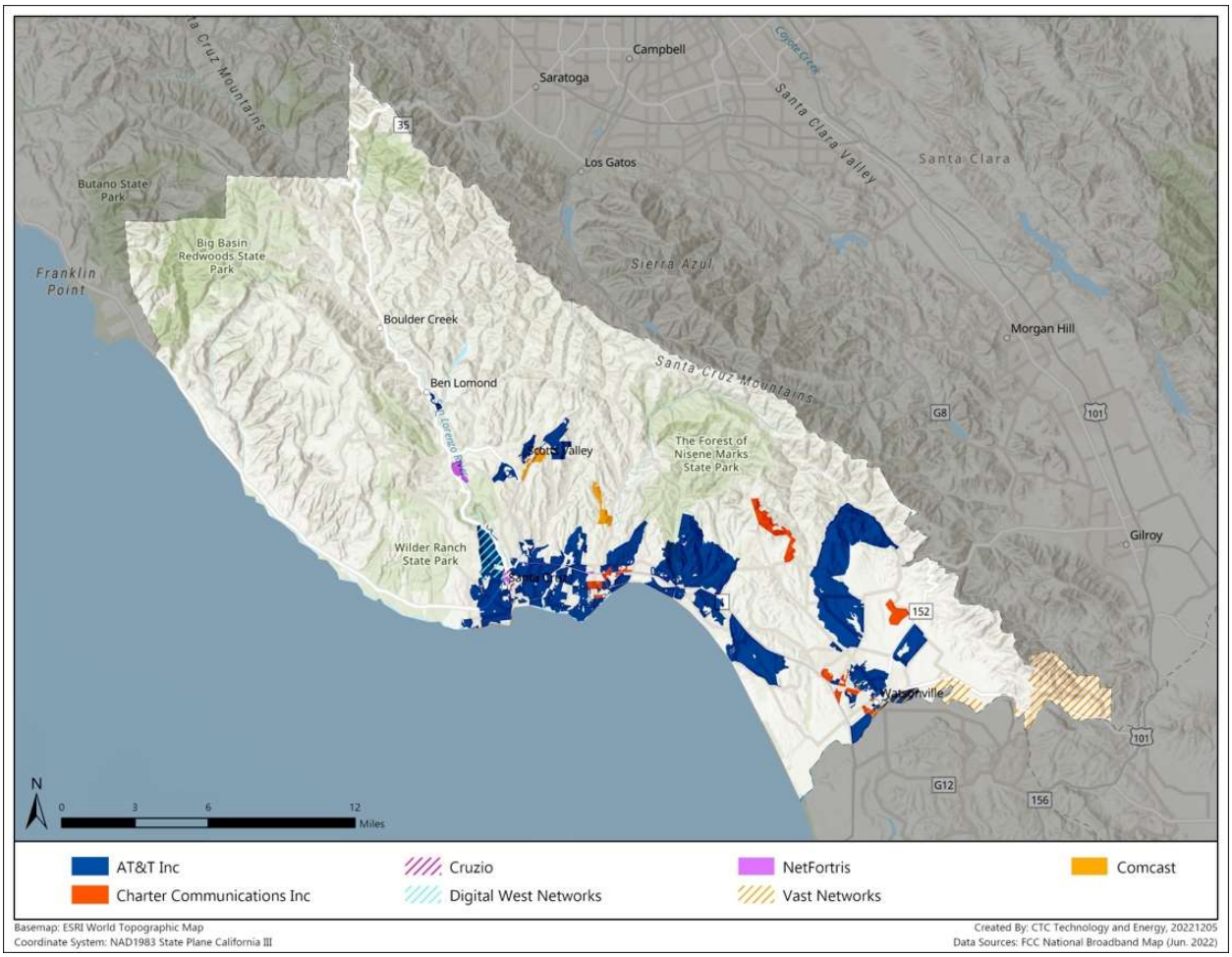


Figure 57 below shows existing fiber providers throughout the County. AT&T, Charter, and Cruzio all have fiber in the two locations mentioned above and could be potential partners. Given that

Cruzio has a partnership with Watsonville schools for its Equal Access program, it may be interested in fiber extension from its current coverage in Watsonville Plaza.

Given that the County is not planning to be an applicant, partnerships with any of the existing providers could be beneficial in extending fiber to these two areas.

Figure 57: Fiber providers at 100/100 Mbps or greater



6.8 Future funding opportunities

6.8.1 FFA applications address some priority areas in the County

On September 29, 2023, the CPUC received eight applications for FFA project funding in Santa Cruz County. These applications request $26.9 million and cover just over 5,400 unserved locations, as defined by the CPUC FFA map.[71] These projects primarily serve locations in Santa

[71] There are significant discrepancies between the CPUC FFA data of "mass market unserved" locations and data from the FCC National Broadband Map. Generally, the CPUC's data shows a higher number of unserved locations

Cruz County, but some projects also propose to serve locations in Monterey and Santa Clara counties. The total amount requested for projects in the County far exceed the allocated amount of $10.3 million. The CPUC has stated that it may take up to six months to award funds for these projects.

This timeline may allow the County to determine the areas that will be served by a funding commitment from the state FFA prior to its review of the list of BEAD eligible locations, thus providing the County with a clearer picture of its broadband needs to determine the need for any objections to the BEAD eligibility list and to plan for future BEAD funding.

Even if the FFA projects are only partially funded, they are likely to make significant progress in addressing unserved areas in the County. Upon successful completion, these projects will serve hundreds, perhaps thousands, of households with FTTP projects, including in priority areas identified by the County. However, because of the long timelines associated with these projects, the dominance of AT&T funding requests, and the lack of projects in the northern part of the County, these FFA projects will not fully accomplish the County's goals. These projects are not likely to increase competition in the County nor do these projects address the unserved locations in critical areas such as San Lorenzo Valley. Moreover, the improved access to services for County residents will not materialize until the second half of 2025 at the earliest.

6.8.1.1 FFA applications focus on southern half of the County

Five of the eight applications request $14.1 million for projects to serve 1,748 unserved locations exclusively in middle and southern parts of the County. The remaining three applications cover multiple counties. Figure 58 provides a visual summary of the applications submitted to serve locations in Santa Cruz County.

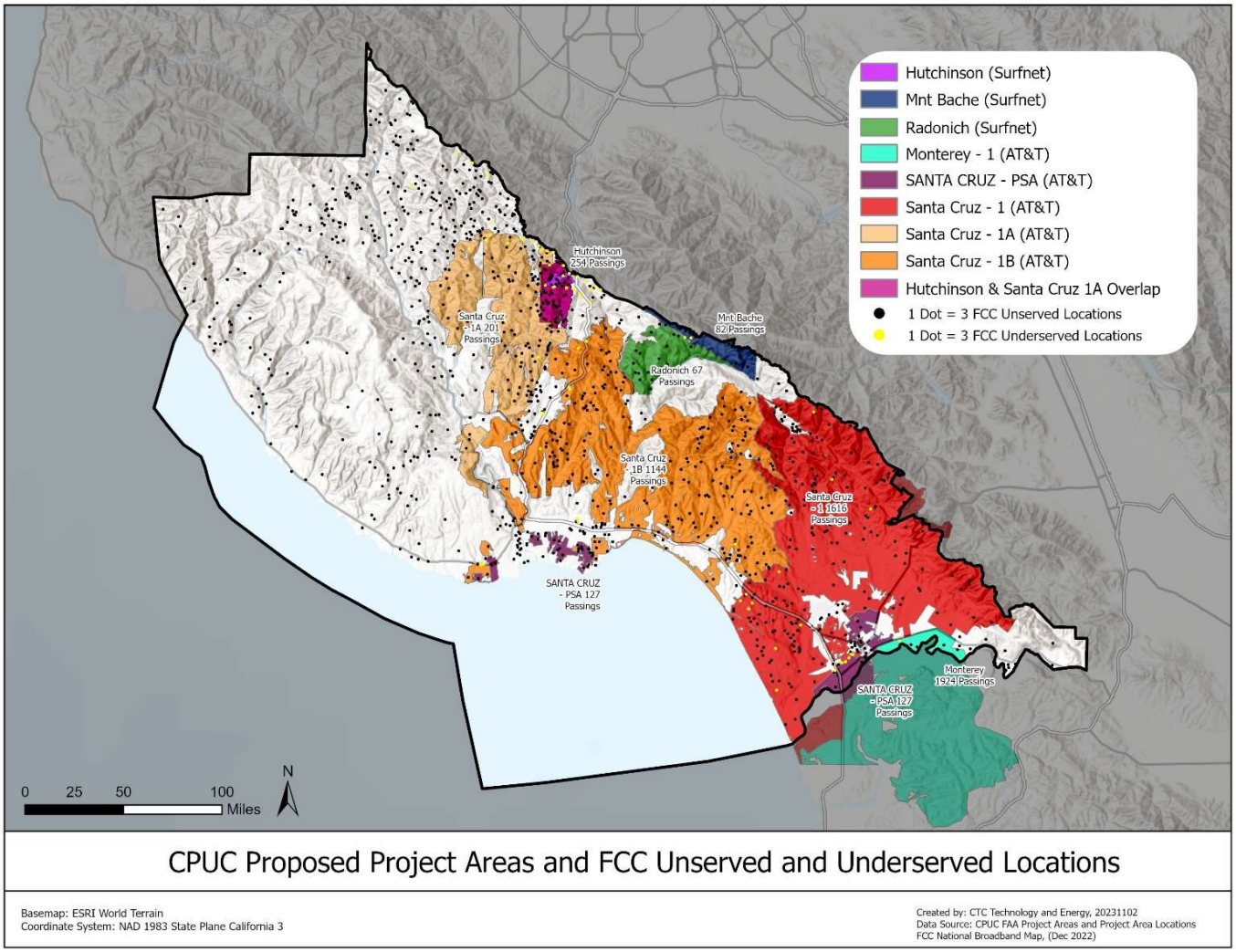
Two of the multi-county projects, AT&T's "Santa Cruz 1" and "Santa Cruz PSA" primarily serve locations in Santa Cruz County, with only a small number of locations in neighboring counties. The vast majority of locations in AT&T's "Monterey-1" project, however, are outside of the County with only a small number of locations east of Watsonville. If any of these three projects are funded, it is unclear how the project awards will be proportionally allocated across the different county allocations.

If approved, AT&T's five projects would fund 5,000 of the total locations. Surfnet's three projects include just over 400 locations. These projects commit to deploying FTTP networks with speeds

because of the broader definition of "unserved" used by the CPUC. The FFA applications rely on CPUC mapping data and will consistently show higher numbers of unserved. See Sections 6.6 and 6.8.1.3 for further explanation. Under the rules of other federal funding programs, such as BEAD, states are required to use the FCC mapping data to identify locations that will be eligible for funding.

up to 5 Gbps symmetric through AT&T's fiber projects and speeds at 1 Gbps symmetric for Surfnet. There is overlap between Surfnet's and AT&T's proposed projects that cover a significant amount of the locations in Surfnet's Hutchinson project.

Figure 58: FFA funding applications to serve Santa Cruz County



The following table links to the applications as they are listed in the CPUC Broadband Grant Portal.[72]

[72] https://broadbandportal.cpuc.ca.gov/s/objection-page

Table 27: Summary of FFA funding applications in Santa Cruz County

Project	County Name	Grant Amount Requested	Number of Unserved Locations	Total Project Cost	Total Cost per Location	Grant Cost per Location	Applicant
Projects exclusively in Santa Cruz County							
Hutchinson[73]	Santa Cruz	$2,246,979.72	254	$2,246,979	$8,846	$8,846	Surfnet
Mnt Bache[74]	Santa Cruz	$1,008,201	82	$1,008,201	$12,295	$12,295	Surfnet
Radonich[75]	Santa Cruz	$967,908	67	$967,908	$14,446	$14,446	Surfnet
Santa Cruz -1A[76]	Santa Cruz	$949,706	201	$1,899,412	$9,450	$4,725	AT&T
Santa Cruz - 1B[77]	Santa Cruz	$9,000,252	1,144	$18,000,504	$15,735	$7,867	AT&T
Total		**$14,173,047**	**1,748**	**$24,123,004**			
Projects that cross county boundaries							
Santa Cruz- PSA[78]	Monterey, Santa Cruz	$90,205	127	$180,410	$1,421	$710	AT&T
Monterey -1[79]	Monterey, Santa Cruz	$11,950	1,924	$21,304,143	$11,073	$6	AT&T
Santa Cruz - 1[80]	Monterey, Santa Clara, Santa Cruz	$12,650,000	1,616	$21,357,182	$13,216	$7,828	AT&T
Total		**$12,752,155**	**3,667**	**$42,841,735**			

6.8.1.2 FFA applications exclude important priority areas, but cover disadvantaged communities

As discussed above, the County has identified specific communities as priority targets for broadband investment because they have significant numbers of unserved or poorly served locations. Preliminary analysis of the FFA application summaries and mapping data show that only a few of these areas, primarily in the southern half of the County, are included in these project proposals.

[73] "Application: Hutchinson," CPUC, https://broadbandportal.cpuc.ca.gov/s/gms-application/a0K3d000002ba6FEAQ/hutchinson (accessed November 10, 2023).
[74] "Application: Mnt Bache," CPUC, https://broadbandportal.cpuc.ca.gov/a0K3d000002bZtUEAU (accessed November 10, 2023).
[75] "Application: Radonich," CPUC, https://broadbandportal.cpuc.ca.gov/a0K3d000002bZdREAU (accessed November 10, 2023).
[76] "Application: Santa Cruz – 1A," CPUC, https://broadbandportal.cpuc.ca.gov/a0K3d000002bxNPEAY (accessed November 10, 2023).
[77] "Application: Santa Cruz – 1B," CPUC, https://broadbandportal.cpuc.ca.gov/a0K3d000002bxNeEAI (accessed November 10, 2023).
[78] "Application: Santa Cruz – PSA," CPUC, https://broadbandportal.cpuc.ca.gov/a0K3d000002bqzBEAQ (accessed November 10, 2023).
[79] "Application: Monterey – 1," CPUC, https://broadbandportal.cpuc.ca.gov/a0K3d000002bkhsEAA (accessed November 10, 2023).
[80] "Application: Santa Cruz – 1," CPUC, https://broadbandportal.cpuc.ca.gov/a0K3d000002bxN5EAI (accessed November 10, 2023).

There are several areas of the County identified as priority areas that did not receive applications for funding, especially in the northern and western parts of the County such as Davenport, Bonny Doon, and San Lorenzo Valley (Boulder Creek and Ben Lomond). Additionally, while there are applications that propose to serve targeted areas within the City of Santa Cruz, lower income areas such as Beach Flats were not included despite a showing of significant numbers of unserved on the CPUC's FFA map and the additional scoring consideration that a project this area would have earned under the FFA rules as a "low-income" area.

AT&T's proposed projects are concentrated in the middle and southern half of the County and cover a significant number of square miles with varying numbers of unserved within each project. Its projects cover significant numbers of unserved locations in the County's priority areas of Corralitos, Watsonville, and Pajaro Valley. Notably, the center of Watsonville is not included in any of the proposed projects although the CPUC's FFA map shows a cluster of unserved mass market locations in that area.

A small portion of the application project areas, primarily in the Watsonville area, are also the only locations within the County to be designated as "disadvantaged communities" using data from the California Environmental Protection Agency. Pursuant to the CPUC's FFA rules, AT&T will receive additional points for projects where 50 percent of the unserved locations to be served by the project fall into a designated disadvantaged community. AT&T's Santa Cruz-1 and Santa Cruz PSA projects include this designation. Additionally, AT&T will receive additional points for the significant match amounts it proposes of approximately 50 percent for each project.

Surfnet's three proposed projects are in the northeast of the County along the border with Santa Clara County in Summit West and the Highland areas. One of these projects has considerable overlap with an AT&T project. These projects do not include disadvantaged communities nor does Surfnet propose to provide any matching amounts for these projects. Surfnet states that they have secured a $2.5 million line of credit to assure the CPUC that they have the funding to complete these FTTP projects.

6.8.1.3 Comparison of the FFA project areas to FCC National Broadband Map data

The impact of these proposed projects on efforts to expand service to the County, and the costs of these projects relative to the allocation for County projects, may change if the CPUC's review also considers the service availability data from the FCC National Broadband Map.

A brief comparison between the CPUC FFA data of "mass market unserved" locations and data from the FCC Map shows a significant discrepancy between the two data sets. Generally, the CPUC's data shows a higher number of unserved locations because of the broader definition of "unserved" used by the CPUC.

This discrepancy in the data suggests that proposed FFA project areas may already have fiber and cable infrastructure offering services at broadband speeds and are thus considered "served" by the FCC. This discrepancy means that the number of unserved locations on the CPUC FFA Map allows for more funding in each project area that will not only build new infrastructure, but also upgrade and expand service to areas currently served by fixed wireless, DSL, and older cable technologies. The FCC does not draw such a bright line between served and underserved by technology type and would designate these areas as served.

Therefore, after the CPUC's objection process and analysis of FCC service availability data during the review process, the resulting funded projects may be different than the initially submitted projects. The CPUC may eliminate locations from the proposed projects because the FCC data shows the areas are currently served or have existing funding commitments to be served by other funding programs. The full picture of how the FFA funding will be applied in Santa Cruz will not be clear until the CPUC announces its grant awards in the first quarter of 2024.

6.8.2 Other funding allocations

6.8.2.1 Pending CASF projects may address some priority areas and will have future funding rounds

In addition to the pending FFA applications in the County, there may be other opportunities such as the CPUC's CASF funding that will support projects with lower speed thresholds and non-fiber technologies. Surfnet, Cruzio, and LCB Communications have pending CASF applications submitted in May 2023 totaling over $50 million in broadband funding for projects throughout the region, including many locations in Santa Cruz County.[81] Surfnet applied for a $11.7 million fiber project covering four counties, including locations in Santa Cruz County. LCB Communications also has a pending CASF application to serve parts of Santa Cruz County with a hybrid fiber and fixed wireless network that also includes segments of middle mile facilities. Cruzio is requesting over $10 million in CASF funding to expand its Equal Access program in multiple counties, including Santa Cruz.

As noted above, the County should monitor the CPUC's CASF program for the awards under this program as part of its broadband planning analysis. The CPUC estimates that this round of CASF awards will be announced at the end of February 2024. In addition, the County should monitor for future funding rounds and legislative extensions for funding of CASF and its Broadband Infrastructure Account as a funding tool to work with ISPs to support projects in priority areas.

[81] CPUC, CASF Broadband Infrastructure Grant Account, Project Summaries as of June 1, 2023, https://www.cpuc.ca.gov/industries-and-topics/internet-and-phone/california-advanced-services-fund/casf-infrastructure-project-summaries.

6.8.2.2 BEAD funds will prioritize fiber projects in unserved areas, but some alternative technologies may be considered for these long-term projects

For priority areas that do not receive new investment through the FFA or CASF, there may be other opportunities to support broadband expansion through the CPUC's implementation of the federal BEAD Program. This $1.86 billion infrastructure investment program will be a critical element for California's Broadband for All initiative to achieve universal service and close the digital divide in California and will be implemented in coordination with and as a complement to, the FFA and CASF programs.

The CPUC is currently conducting data analysis and working with the NTIA to review and approve elements of this funding program. In its BEAD Five-Year Action Plan submitted to the NTIA in August, the CPUC stated that its BEAD program will:

> "create a holistic approach and framework for California's broadband infrastructure funding programs to encourage and support projects that will advance equal access to affordable, high-performance broadband and also include the devices, training, and skills necessary for digital inclusion of all Californians."[82]

After approval of its programmatic plans by the NTIA, the CPUC will revise its mapping and service availability data and release a tentative list of eligible locations for BEAD funding. As part of the BEAD program, the CPUC will conduct a challenge process for ISPs, local governments, Tribal entities, and nonprofits to object to the list. The CPUC will consider many types of objections to the eligibility list including objections that the list is over-inclusive because it inadvertently includes served locations or locations subject to a planned and funded project, or the list could be under-inclusive because it omits unserved locations or key community anchor institutions.

The challenge process is critical because the CPUC believes it is unlikely that there will be sufficient funding from the BEAD allocation of $1.86 billion to fund additional projects beyond those with unserved locations.[83] Therefore, the County's opportunity to use BEAD funding will be limited and it should ensure the funding is targeted to key priority areas and important anchor institutions, including public safety and education. Under the BEAD rules, the County will be eligible to participate in the challenge process and should plan to do prior outreach and analysis to determine appropriate challenges to the list.

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[82] State of California, Five Year Action Plan, BEAD Program (August 28, 2023), at page 10, https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/communications-division/documents/broadband-implementation-for-california/bead/california-bead-five-year-action-plan---final-draft---20230828.pdf.

[83] *Id.*, Five Year Action Plan, at p. 105, https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/communications-division/documents/broadband-implementation-for-california/bead/california-bead-five-year-action-plan---final-draft---20230828.pdf.

Once the eligibility list is finalized, the County can use the list to identify locations that are unserved by speeds faster than 25/3 Mbps or that are underserved with speeds less than 100/20 Mbps. The County can work with ISPs in a variety of ways to create projects for BEAD funding to serve these areas.

The CPUC must use its BEAD funding to address all unserved areas in the state as a priority, prior to funding other types of projects. However, the CPUC has the discretion to accept applications for projects that will serve both unserved and underserved areas as a way of encouraging economically viable projects that expand broadband access to a significant number of residents. In this situation, the CPUC would prioritize unserved locations through scoring or weighting of key application elements.

The County would benefit from a decision by the CPUC to accept applications to serve both unserved and underserved locations in its first round of BEAD funding because it has many more underserved locations and relatively few unserved, including in its priority areas. This type of grant design would allow ISPs in Santa Cruz County to apply for BEAD funding for projects that support broadband access to a wider set of potential customers. The County should monitor the development of the BEAD rules and take proactive steps to educate policymakers about programs designs that will support the needs of the County's residents.

By the third or fourth quarter of 2024, Santa Cruz ISPs should be ready to submit applications. The CPUC will prioritize FTTP infrastructure, but it is likely that the CPUC will allow proposals for some mixed technologies including fixed wireless in high-cost locations. The CPUC will consider these alternative technologies to balance the preference for future ready and reliable fiber technology with the goal of universal service to all Californians. As discussed above, newer fixed wireless technologies may provide significant cost savings and high performance under the appropriate conditions. The County should work with ISPs to determine where fixed wireless and other alternative technologies will be most appropriate and the most efficient use of grant funding.

Additionally, the BEAD rules make it likely that these applications will also require ISPs to provide at least a 25 percent match, comply with strict labor and resiliency conditions, offer some opportunities for digital inclusion programs, and complete these projects within three to four years of funding awards. As the CPUC's plans become clearer in 2024, the County's best role may be to educate ISPs about this complex funding program and support applications through partnerships and other mechanisms discussed above.

Appendix A: Methodology and data sources

These analyses are built on publicly available data, including the FCC's National Broadband Map and the U.S. Census Bureau's American Community Survey.

The FCC collected and mapped broadband availability data through its Form 477 data collection process until 2022 when it transitioned to its Broadband Data Collection process and the National Broadband Map.[84] Historical data from the Form 477 data collection process is still posted on the FCC's website.[85] However, all ISP data, including remaining Form 477 data regarding broadband subscriptions, are now collected through the FCC Broadband Data Collection process.

This assessment recognizes that National Broadband Map relies on self-reported coverage and availability data by ISPs down to the address level and that these data have not been verified by the FCC or any other third party before being included in the Map. The data may tend to overestimate service availability, especially for specific service technologies and in less populated areas where FCC and service provider data of service coverage may be more difficult to collect and verify.[86] This is also true of areas with a high density of multi-dwelling units, which may show high speed service availability at the doorstep of the building but lack internal wiring sufficient to deliver broadband speeds to all units or may have exclusivity agreements with ISPs that are not reflected in the data.

Despite its limitations, the FCC's National Broadband Map represents the most comprehensive national data set for broadband availability and presents value for understanding broadband investment and availability patterns. It is also important to note that the National Broadband Map will be updated and refined on an ongoing basis through several different types of challenge processes administered by the FCC.[87] The FCC updates the locations of broadband serviceable locations on the Map (the address fabric) every six months. The service availability data on the Map, the technology and speeds offered at each broadband serviceable location as reported by the service provider, is updated on an ongoing basis based on resolved challenges.

[84] https://www.fcc.gov/BroadbandData.
[85] https://broadband477map.fcc.gov/#/.
[86] FCC service data are also inconsistent for non-populated areas such as parks or wildlife reserves which are especially prevalent in Santa Cruz County. For example, if an ISP has extended service to a single visitors' center or building, the data may show a large unserved area around that location as being served.
[87] Government entities can engage in a detailed "bulk" challenge process of the coverage and address data in its area. https://www.fcc.gov/BroadbandData/governments (accessed March 6, 2023); the public is also encouraged to review the map and challenge incorrect coverage data for areas that may be familiar to the reviewer (home, school, work). https://www.fcc.gov/BroadbandData/consumers (accessed March 6, 2023). In both cases, the challenges will be reviewed by the FCC and if deemed appropriate, will be forwarded to the relevant ISPs for review and correction.

The CPUC maintains two interactive broadband coverage maps. These maps are not as granular as the National Map.[88] The CPUC's FFA map uses the FCC National Map as its starting point and further validates the data using address-level data collected directly from California ISPs. The CPUC has also adopted a rebuttable presumption that broadband serviceable locations served only by "legacy technologies" of DSL or cable system DOCSIS 2.0 or lower are considered "unserved" and these locations are indicated as "unserved" on the FFA Map.[89]

The CPUC's Broadband Interactive Map is linked to the CASF's Broadband Investment Account program.[90] This map shows service availability data as of December 2021 on an aggregate census block level. It categorizes a census block as "unserved" if the area does not receive speeds of 25/3Mbps or lower, regardless of technology. In other words, this Map shows areas served by DSL, any cable DOCSIS release, and fixed wireless as potentially "served" if the service provider reports offering service in the area.[91] Importantly, this Map shows deployment and availability only at the census block level, which means specific broadband serviceable locations within a census block may not be served even if the census block is marked as "served" on the CPUC Map.

[88] "CPUC Annual Collected Broadband Data ," CPUC, https://www.cpuc.ca.gov/industries-and-topics/internet-and-phone/broadband-mapping-program/cpuc-annual-collected-broadband-data (accessed February 20, 2023).
[89] "Broadband Data Submission Guidelines and Templates," CPUC, https://www.cpuc.ca.gov/industries-and-topics/internet-and-phone/broadband-mapping-program/broadband-data-submission-guidelines-and-templates.
[90] California Interactive Broadband Map, https://www.broadbandmap.ca.gov/
[91] The CPUC Interactive Map does offer the ability to separate areas that have fiber or DOCSIS 3.0 or higher and those that have access to only legacy technologies through different map layers.

Appendix B: Stakeholder feedback

ISPs

The County of Santa Cruz and CTC convened several stakeholder meetings with internet service providers (ISPs) to gather information about their existing coverage, current programs, plans for expansion, and any barriers they experience to building within the county.

The ISPs that participated in these meetings included:

- AT&T
- Charter
- Cruzio
- Comcast
- Surfnet
- Verizon
- T-Mobile

The service territory of each ISP is further described and mapped in Section 2 of this report. Summaries of the insights provided by each ISP are detailed below. An overview of each

AT&T

AT&T has a large presence in Santa Cruz County. As shown in Section 2.4, AT&T is the primary fiber provider in the County and has deployed fiber facilities primarily in urban and more dense suburban areas. During the meeting, AT&T stated that its middle mile fiber is all within Caltrans' right-of-way across Davenport, Ben Lomond, Boulder Creek, Aptos, and Watsonville while its last-mile fiber is localized in cities, such as downtown Santa Cruz, Watsonville, and Live Oak. AT&T reported that its fiber achieves 1 gigabit (GB) speeds, and in some instances can reach speeds of 5 GBs. Additionally, AT&T is still providing legacy DSL services to existing customers but is not offering it to new customers.

The biggest barrier to building fiber into new areas across the County is the high cost to build. Hilly terrain with certain sparsely populated areas often makes it technically difficult and financially infeasible to lay fiber in places like San Lorenzo Valley and Bonny Doon. AT&T stated that the customers who express frustrations about low speeds generally live in the rural and hard-to-reach areas of the County and that additional investment would be necessary to address the issues experienced by these populations.

Although AT&T representatives stated that the County permitting office was not an impediment or bottleneck for previous projects, wireless permitting improvements could help to bring coverage and connectivity to new areas. Fiber will be required to link the development of new cell sites in the County, providing AT&T with opportunities to leverage the new fiber for other uses. AT&T stated that it has no specific plans to expand in the County through upcoming large

projects, but it has expressed interest in responding to any RFP or RFI that may be issued by the County for specific projects.

AT&T also discussed its low-income programs and participation in the ACP. AT&T customers that qualify for both ACP and the AT&T Access program can receive service for free. The meeting representatives did not have specifics about the terms and conditions of the AT&T Access or ACP programs, but they were confident that AT&T's service offerings meet the requirements for ACP. AT&T does not have a dedicated outreach team to educate and enroll its customers in these programs, but its external affairs and sales teams are given the tools to start outreach on these discount programs quickly after a new fiber build has broken ground.

The representatives also discussed AT&T's pandemic outreach efforts and programs to provide free hotspots for students and connectivity for public safety such as the Bonny Doon firehouse. AT&T also discussed work to support Davenport with increased connectivity during a technology transition.

Comcast (Xfinity)

Comcast has a very large coverage area in the County with its Xfinity service – in all parts of the County except the northwest and the southeast. The company plans to upgrade its equipment to DOCSIS 4.0 by 2025, providing symmetrical gigabit speeds. It operates a hybrid fiber-coaxial network and is attempting to reduce the number of customers served by a single node. It has no current plans for expansion in the County; however, representatives identified that the region north of Davenport and Aptos Hills are areas that may need stronger service. Comcast's main challenges for building fiber in Santa Cruz County are the varied terrain in the north of the County and the additional costs for resiliency planning for major weather events in California.

The areas in the County that are the hardest to cover, according to discussions with Comcast, are north of Davenport, the Summit, and the Santa Cruz Mountains. These areas have low population density, difficult terrain, and high construction costs.

Comcast representatives discussed the issue of overloaded poles in the County. Deployment in these areas often requires underground construction, which is costly and requires additional permitting. Representatives also stated that permits require a wait of a year or more.

The company participates in the ACP with two plans that are free to qualified households when combined with Comcast's own low-cost programs. Without the $30 ACP subsidy, Internet Essentials is $9.95 per month for speeds of 50/10 Mbps and Internet Essentials Plus is $19.95 per month for 100/10 Mbps service. By combining ACP discounts with these programs, qualified households receive free services. Under the Comcast programs, when combined with ACP, certain equipment is also provided at no cost and there is no term for a contract for these plans.

Comcast representatives stated that the company has made a big push for ACP enrollment through its outreach programs, which require resources and are high-touch processes.

Charter Communications

Charter service areas are primarily in the southern part of the County and include both cities and rural areas. Charter provides a hybrid fiber-coax network for residential service in these areas, with fiber to the node and coax to the premise. Charter uses mostly aerial infrastructure, which at times can be a challenge, as Santa Cruz County poles are overloaded and permits have extended processing times.

Charter stated it has rural deployment currently underway across the County; however, because wireline infrastructure can be costly, the company is actively seeking partnerships with jurisdictions to apply for grants to finance expansion efforts.

Charter has its own low-income service offering of 30/4 Mbps for $19 per month. It also offers discounted service at 100/10 Mbps that, when combined with ACP, can be free for the end user and includes a modem and Wi-Fi router. Charter also uses ACP to discount its faster speed plans for 300 Mbps at $19.99 per month, 500 Mbps at $39.99 per month, and a 1 Gbps plan at $59.99 per month.

Charter also discussed its low-income multi-dwelling unit (MDU) bulk program, which has been offered to migrant camps, housing authorities, and participating school districts. This partnership requires an entity to enter into a bulk agreement with Charter for service speeds up to 50/50 Mbps. The entity becomes the customer of record, and it further administers the provision of services to the end users.

Additionally, Charter has a Digital Literacy Grant, where millions of dollars per year are distributed to stakeholders and organizations working to increase digital literacy and digital skills education. In recent years, it has awarded grants to an organization in Watsonville (Jacob's Heart Children's Cancer Support Services Center) and nearby in Salinas (Loaves, Fishes & Computers).

Charter stated that potential expansion efforts are limited by challenges and barriers to building in the County, primarily pole availability, cost to build nodes, cost of running fiber to nodes, cost of permitting, and Santa Cruz County's mountainous terrain. Charter expressed its willingness to work with the County as a partner to apply for state and federal funding opportunities to expand its coverage in Santa Cruz County. It would also like to use the County as a resource to understand and navigate the needs of municipalities and residents within the County to address digital literacy and affordability challenges.

Cruzio Internet

Cruzio Internet is an independent ISP that has been in business in Santa Cruz County for over 30 years. It has an extensive fixed wireless network and has built out fiber to the premises in the City of Santa Cruz and the City of Watsonville. Its fiber is built with the goal of a fully redundant network with three different paths to ensure resiliency in the face of local challenges such as weather-related disasters. It has received previous grant funding for some of its projects. While the majority of Cruzio's infrastructure in the City of Santa Cruz is fixed wireless, it is expanding aggressively to provide fiber gigabit service to other parts of the City, leveraging the Crown Castle middle-mile infrastructure as its primary backhaul path.

Cruzio stated that the barriers it has faced to expand in the County include lack of funding, pole availability, degradation of poles over time, and power generation.

During the meeting, Cruzio discussed its team's observations that several areas of the County need additional capacity and upgrades to service availability. This includes the North Coast, north of the City of Santa Cruz, the San Lorenzo Valley, on the coast between Capitola and Watsonville, and South County's unincorporated areas. Cruzio would like to build out projects in these areas but would need to rely primarily on state funding due to challenging terrain, a high financial burden and low initial return based on potential customer revenue. To ensure the expansion of its coverage, Cruzio is actively reaching out to community-based organizations, municipalities, and other entities so it can position itself to take advantage of upcoming funding opportunities.

Due to the predominance of aerial infrastructure, pole availability is essential. Cruzio works with Crown Castle to lease space and it does not build its own towers. However, many poles across the County need replacement, which can cost up to $30,000 per pole. Additionally, "absentee pole landlords" cause an issue when ISPs try to receive permission to lease for a buildout.

Cruzio was enthusiastic during the discussion about a new fixed wireless technology it is piloting. Cruzio claims that Tarana Wireless technology should enable reliable connectivity in areas that were considered infeasible based on previously available technology. Cruzio is hoping to work with the County on leveraging this new technology to provide quality service in areas that are currently considered hard to reach.

Cruzio also discussed its Equal Access program that started at the beginning of the pandemic. The company has raised nearly $1 million for projects to cover both infrastructure and discounted services. The Equal Access project provides connectivity to students and their families who may not be able to afford internet service. Completed projects are located in the City of Santa Cruz, Live Oak and Pajaro Valley. This project is a partnership between Cruzio, County Office of Education, and Community Foundation Santa Cruz County, as well as the Housing Authority of

the County, and the Central Coast Broadband Consortium. Cruzio is interested in continuing to fund this program with outside funding.

Surfnet

Surfnet is another independent ISP that has been in business since 2002. It primarily serves regions in the northern part of the County. Its mission is to connect unserved areas that are high cost and have challenging topography. It is mainly a fixed wireless provider with some small fiber builds, almost all of which is aerial fiber. It primarily owns its own facilities but does lease some space on commercial towers. Surfnet has approximately 2,000 residential customers in the County, and provides service to various non-residential customers including schools, public safety, small businesses, HOAs and community centers.

The company sees strong potential for wireless technology to provide gigabit speeds and has conducted pilot programs that produce very fast speeds with wireless. It claims to use fixed wireless technology to provide up to 600 Mbps download speeds up to seven miles away from an access point. However, it acknowledges that Santa Cruz County's topography is challenging due to its dense tree cover and the number of valleys that exist, so that its last mile services can be slow due to challenging terrain and difficulties with upgrades. Surfnet's residential last mile services are generally offered at a maximum speed of 100/20 Mbps, with other services at 50/10 Mbps and 15/4 Mbps in some cases. But Surfnet noted that it is often the only broadband option available to residents of these areas and it believes customers are generally satisfied with these services.

Surfnet has received a grant to extend its fiber in Loma Prieta in the north part of the County to provide service to a preschool and public school in the area. It is also working to extend this fiber to the regional Sheriff's office as a second phase of this effort. Surfnet participates in the ACP but does not have a significant number of customers enrolled in the program at this time. It states that it is looking to develop its own low-income plan as an additional benefit to subscribers. In general, Surfnet expressed frustration with the grant process after dealing with challenges to grant projects that blocked its projects while also finding that these projects allow other providers to overbuild in certain areas.

Surfnet applied for the NTIA Middle Mile Grant, which was primarily a wireless middle mile proposal.[92] This application was submitted in collaboration with several other ISPs in the area and took the CPUC's middle mile project into consideration when building the proposal, so that local facilities could be connected to state infrastructure once constructed.

[92] After this discussion, NTIA announced the grantees for this program on June 15, 2023. Surfnet's coalition did not receive an NTIA Middle Mile grant. To view recipients, visit https://broadbandusa.ntia.doc.gov/funding-programs/enabling-middle-mile-broadband-infrastructure-program/funding-recipients.

Surfnet leases Crown Castle facilities, which it believes are limited in reach. To do a more significant fiber buildout, Surfnet would like these facilities to be connected to more regions inside and adjacent to the County. It stated, however, that it has backhaul and middle capacity at 5 to 6 times the needed bandwidth in the capacity, so its focus is on upgrades to last mile facilities.

Surfnet stated its desire for the County to act as a facilitating partner to apply for state and federal funding with all carriers in the area, and to help providers identify priority areas for future projects. While Surfnet did not disclose any plans to build in new areas of the county, it is looking to upgrade its current last mile facilities near Hutchison Road and the Summit and would like to upgrade and weather-proof its own facilities in Bonny Doon after recent storms and fires.

Verizon

Verizon representatives stated that the company has no wireline facilities in the County after its merger with Frontier and has very little fixed wireless coverage except for small areas in the City of Santa Cruz's downtown region. It leases backhaul and middle-mile capacity from other service providers in the County and does not have its own middle mile facilities.

Verizon stated that it has solid mobile network coverage across the entire county; however, due to challenges experienced when building out towers in the more populated areas, it has been unable to equip them with newest technology to support the most efficient allocation of user traffic and spectrum management. Verizon acknowledged it will need to deploy additional backhaul capacity to accommodate the increased demand for service from the high-density and rural areas within the county. Verizon also made a point that the County has not been a barrier to permitting or build-out plans and has come out in support of some wireless tower projects because the projects will help the County increase its own capacity.

Barriers that prevent Verizon from expanding to new areas of the County include varied terrain, lack of density, and community resistance to projects. Verizon provided an example regarding the recent placements of two towers; due, at least in part, to community protests, the tower siting took five years to complete.

Verizon representatives did not comment on any potential buildouts in the County and could not speak to any potential interest by the Company in federal or state funding. However, Verizon discussed its efforts with ACP and digital equity through its "enhanced communities" team, which has shown success across the state, and has a dedicated individual located in Santa Cruz as of April 2023. This team acts as digital navigators, providing multi-lingual sign-up support and ACP information and outreach. This team frequently partners with local governments, housing entities and direct service providers to promote the ACP to eligible individuals.

Verizon hopes the County can provide continued support for tower siting and applications for funding. Verizon also is interested in the County developing a list of County-based assets for providers to understand where equipment can be placed and strategize locations for future infrastructure build outs.

T-Mobile

T-Mobile has a limited presence in Santa Cruz County for fixed wireless services, with pockets of coverage in Ben Lomond, Scotts Valley, Freedom, and the southeastern corner of the City of Santa Cruz. It does not provide wireline service.

The company has been supporting the Pajaro Valley and Santa Cruz school districts with hotspot programs. T-Mobile participates in the ACP program, but only for cellular services. It sponsors ACP sign-up events throughout the state of California.

Representatives stated that T-Mobile would be interested in future fixed wireless buildouts in areas that are difficult to reach via wireline technology.

Governments

County staff met with the Supervisors for each district to gather information about broadband needs and efforts.

District 1

The meeting took place with Supervisor Manu Koenig and Shane McKeithen, and they discussed

funding opportunities, maps and needs of the residents in the district. Some residents have reported issues, and many of those are from mountainous areas. The greatest priority is helping as many people as possible, prioritizing populous areas that are unserved and underserved.

Some possible areas of concern include:

- Area between Emerald Bay and Soquel Village
- Glen Canyon / Granite Creek Road
- Along Old San Jose Road corridor
- Soquel Village Business Park
- Along Summit Road (including the need for a wireless POP on Loma Prieta School)
- Shangri-La Estates Mobile Homes
- Capitola corridors – 38th and 41st Avenues

Mobile homes and trailer parks are another area of need, but historically there were issues with relationships and getting all the relevant parties, including out-of-state owners, to come together and provide comprehensive solutions.

Emergencies are a big concern – during the last winter, the office needed to work with all the ISPs and county planning department to get back-ups in place. Reliability is still an outstanding issue. Many residents depend on the internet and wireless for emergency communications, and those have gone down repeatedly. All mountain areas are affected. A concern is that even if an ISP, such as Verizon upgrades their infrastructure, it only benefits a portion of the residents. Comcast has successfully worked with their office to get the backup generators in place. Verizon has upgraded the tower infrastructure for the addition of first responder radio equipment. ATT is concerned about the First Net service to first responders.

Affordability is another major concern. The ACP program can help, and the Digital Navigators program through the library has been effective.

District 2

The County met with Zach Friend, Allyson Violante and Kieren Kelly. They discussed overall efforts on broadband, and the need to address issues of access, affordability, equity, quality, and emergencies.

The Supervisor has been working on improving the broadband in the County for many years, including leading the effort on the Dig Once initiatives eight years ago. There is awareness of several initiatives underway providing elements of the final solution, such as State Middle Mile initiative, AT&T deployment of microcells along the major roads, Aptos to Santa Cruz fiber, and the master plan. They are generally agnostic about the last-mile technologies as the topography is challenging and will require creativity for full coverage. There are new technologies being deployed in Yuba and Sutter Counties that might be helpful, due to increasingly suburban needs, with rural internet deployments in place. Organizations like Rural County Representatives of California (RCRC) might have frameworks that are helpful.

The constituent needs are focused on immediate gaps, such as the ability for students to do homework. In some areas there is current infrastructure that stops abruptly, and one street over there might be satellite only access. Many locations also only have access to a single provider, limiting options, level of service, and affordability.

Priorities for upcoming funding include building infrastructure, and possibly reinvesting any funds collected to expand further into more rural areas.

Some of the corridors, such as Day Valley, are very challenging. Corralitos also needs better options and constituents have asked for improvements.

District 3

County staff met with Justin Cummings, Sandy Brown and Andy Schiffrin. They discussed funding opportunities, maps and needs of the residents in the district. They acknowledged that there is a lot of good effort, but it is siloed.

The priority areas for coverage in this district include Bonny Doon, Whitehouse Canyon Road, Last Chance Road and the Town of Davenport. The areas that have issues with affordability include Beach Flats, West Side, and downtown. There also are affordability issues with the DeAnza and Clearview mobile home parks.

Similar to other districts, the topography is challenging, with vegetation and trees severely limiting the effectiveness of traditional wireless solutions. The pilot projects with Tarana Wireless used by Cruzio and Surfnet might offer new solutions.

Emergency communications are a significant concern. Most telecom companies did not meet the mandated 72-hour uptime in the last emergency. The office is trying to streamline the permitting process. Cell coverage limits are also an issue.

Community partnerships will be key to achieving goals in the district. The office is also concerned about workforce training and access for new housing developments.

District 4

This meeting took place with Supervisor Felipe Hernandez and Ramon Gomez in attendance. This district is concerned about expanding Wi-Fi access in areas such as the Veteran's Hall and the fairgrounds. Some projects funded through ARPA to Cruzio were mentioned, but these projects will not achieve complete coverage. Specific areas that need better connectivity include:

- Mesa Village Park
- Pinto Lake
- Casserly Road
- Hwy 129 towards Mount Madonna
- Hwy 152

Of top importance is the ability to maintain communications and access to information in emergencies. Partnerships are important and organizations such as Community Action Board and Community Bridges could be a good source of additional information on the community needs.

Affordability is a big concern, and programs like ACP and Digital Navigators help bridge the digital divide. It is important to keep raising awareness of them.

District 5

Staff met with Supervisor Bruce McPherson and Gine Johnson in District 5. Supervisor McPherson brought up the question of emerging technologies and the possibility of including them in the overall broadband plan, as constituents have cited examples of new, possibly disruptive options beyond fiber. The geography in the County is very challenging and new options would be well received.

Response to emergencies and communications, both during emergencies and in general, are a significant concern. The evacuations done by the Sherriff have been done impeccably, but communications were a challenge. For the master plan, both the placement of the infrastructure and good communications are important. With the population in the district, the risks of communication failures cannot be overstated – senior citizens can get isolated, and not be able to receive critical services, such as food or heating, or even be aware of approaching disasters. Last-mile infrastructure must be developed and deployed to address their needs.

The solution will need to be multifaceted, include both a short-term and a long-term plan. There are pieces of the solution underway, and there is more that needs to be done. For instance, the CPUC requires providers to have battery backups for wireless service, but they are very limited. Generators could extend the uptime for up to five days, but are limited by tank size, and many would not last this long. Some of the towers do not have any additional capacity, for instance in Boulder Creek. The emergencies and communications are something that OR3 office and David Reed are also looking into. There are challenges presented by constituents, such as resistance to new towers, beyond simple engineering solutions. Between AT&T abandoning copper and no available towers, citizens are left with nothing. Deploying fiber where possible is critical, but it is not feasible everywhere.

Central points are important and partners such as Cal Fire, and the libraries, which provided warming centers during the last emergency, are critical. The plans to extend one of Cruzio sites in Felton will help with the services in that area.

For the Boulder Creek area, the Boulder Creek Business Association is an active potential partner. With the current communication challenges, there might be enough interest in the area to move forward with adding a pole.

The state middle-mile project along Highway 9 is a critical part of providing better services in the area, and we are very glad that they heard the input from us and the community. As maps become available, we will want to notify residents through the newsletter, and look for the opportunities to deploy last mile connections.

Broadband access is important. With federal and state funding becoming available, it will be critical to leverage is strategically with an equity focus. San Lorenzo Valley needs better connectivity and is seen as underserved, so it is an important focus area.

City of Watsonville

CTC and the County met with Brandon Gill, Director of IT for the City of Watsonville. The City of Watsonville is primarily an agricultural community in the southern part of Santa Cruz County. The biggest businesses located in the area are Martinelli's, which produces apple juice and cider, and a large FedEx distribution facility. These companies have not expressed dissatisfaction with broadband access to the City. Demand for broadband also comes from the Pajaro Valley Water District and new affordable housing developments. The County will have new facilities in Watsonville that will increase demand.

One of the biggest issues for the City is aging infrastructure. For example, it replaces a mile of water main per year due to the state of the pipes. Another issue is lack of cellular coverage in certain areas. Brandon Gill also noted another barrier – that residents often use cash only and some lack citizen status, making it hard for them to subscribe to services or programs.

Broadband usage

The City of Watsonville has its own dark fiber network that it developed in conjunction with Cruzio. The City has two 1 GB circuits but is moving toward a 10 GB connection over the next five years. Cruzio is planning to upgrade the City's facilities in the area and increase capacity to 40 GB and 100 GB. Watsonville also offers middle-mile access services on its fiber.

The City has lease-and-trade agreements for capacity, colocation, and discounted services with Cruzio, Surfnet, the Sheriff's office and Ridge Wireless, which provides cameras for wildfire detection. It leases some rooftop space to Cruzio to house equipment. It also partners with the County for public safety radio services and tower space to address limited cell coverage, which can create challenges for emergency notifications.

In terms of last-mile service, the City is relatively well covered through AT&T and Charter Spectrum. The low-lying areas are the most affected by limited wireless and wireline facilities for both cellular and broadband services, where signals can pass over areas without providing connectivity. In these locations, it is often difficult to deploy sufficient wireline facilities. During the meeting, the City cited an example of a senior living community that has both connectivity and affordability concerns and struggles with access to broadband.

Needs and planning

Given the number of recent natural disasters in the area, including fires and flooding, it has become a priority for the City to further develop its evacuation notification process. The City discussed problems with cell coverage that prevent emergency alerts and notifications from

reaching all residents. During recent emergencies, this issue seemed to impact low-income seniors significantly. Fire teams also need improved cell coverage to use their equipment. The City has partnered with AT&T and T-Mobile to develop small cell sites in low-income areas to improve cellular coverage, and it is looking into putting up "extenders" to increase wireless coverage in the City.

Watsonville also developed a broadband plan for the upcoming budget cycle, which was published in the beginning of the fiscal year 2023-24. The City noted the need for increased coverage to support telehealth for Watsonville Community Hospital, but was not familiar enough to provide details during the meeting. It is also working on a dig-once policy and will be requiring geolocation information for the deployed conduit to develop better record keeping. It is also working on a small cell antenna ordinance.

Watsonville's fiber network is currently "orphaned" and does not have sufficient interconnection with other networks. It has experienced challenges in deployment of the fiber across major City intersections like Main Street and difficulty working within the state highway right-of-way and railroad crossings that go through town. The City hopes to leverage the state-owned open access middle-mile infrastructure that is planned to go through Watsonville to create a complete ring network.

The City of Watsonville would like to leverage the County's relationships and develop informal coalitions to enlist additional project partners. It also would like to have the County act as an advocate at the state level with the legislature and state agencies like the CPUC. It urges the County to consider a bulk purchasing structure to help cities under a single contract where there may be discounts for services and a wider variety of vendors to create competition. It is also looking to the County for other partnership, colocation, and service agreements that could include placing equipment on additional County and City facilities to mutually support each other's expanded network capacity.

City of Santa Cruz

The County and CTC met with Laura Schmidt, the Assistant City Manager of the City of Santa Cruz.

The City has not been deeply involved in broadband infrastructure deployment for the area, nor has it received much feedback from the community about access and adoption. According to the Assistant City Manager, community members generally go directly to the ISPs for information about broadband coverage. The main areas of need are Beach Flats, which is likely an affordability issue rather than a coverage issue, and some mobile home parks.

The City itself uses both Cruzio and Comcast for its operations, both fiber and cable. The City has not completed any broadband planning to date, as it has had relatively comprehensive coverage

from multiple ISPs. There is existing "old" dark fiber from cable franchise days, but it is not clear how it is being used now.

City of Capitola

Participants in the stakeholder meeting for the City of Capitola included Chloe Woodmansee, the Assistant City Manager, and Heather Haggerty, the IS Specialist. Capitola is just two square miles and is located along the coast south of the City of Santa Cruz.

City officials claimed that their internet needs were generally met, for both government and residents. The City government uses fiber by both AT&T and Charter Spectrum; it has not experienced downtime or speed issues that were notable. The City has not heard from residents with complaints about inadequate access to broadband. The State of California Middle-Mile Broadband Initiative has a planned project right through the City.

Though City officials said that broadband access has not been a problem in general for residents, there is a concern about affordability of service. Residents of mobile home parks and low-income housing and seniors have the most significant challenges and may not be able to afford internet service that meets their needs.

City of Scotts Valley

CTC and the County met with the Police Chief of the City of Scotts Valley and gathered data from the City's IT consultant and Community Development Director.

Broadband usage

The City requires broadband access sufficient to work with hosted services such as Office 365 and Microsoft Teams and capability to support 24/7 public safety software systems and infrastructure. The City uses both AT&T fiber as well as Comcast services, but would like to have additional fiber services for enhanced reliability. The City is continuing to increase its usage of cloud services in the form of SaaS applications and business continuity, and therefore reliable and redundant connections are necessary. The City requires reliable vendor redundancy and synchronous data speeds up to 1 Gbps. There are redundant fiber ISP connections, and the available capacity will be sufficient for the next 5 years.

The City has not completed any analysis and planning of broadband needs for the residents of Scotts Valley. It has been involved in supplying free and reserved Wi-Fi connectivity at SkyPark.

Service reliability is an issue for residential customers. Comcast is the only ISP that provides 100 Mbps speeds to most areas of the City. Comcast has regular outages under the best circumstances, and it goes out more often and for longer time periods when there are weather events. The City staff stated that AT&T claims to have high-speed access, but its residential service often offers less than 50 Mbps download. They mentioned that both AT&T and Comcast

suffer from capacity issues, and service is inconsistent. Representatives expressed concerns about bandwidth on Scotts Valley Drive, Granite Creek Road, and Whispering Pines. They also mentioned that poor cellular coverage was an issue.

City staff stated that residents would benefit from additional competition in Scotts Valley, which would provide residents with the option to shop for lower internet pricing and would incentivize ISP providers to invest more in their services and infrastructure. Lower income families may not be able to afford the $60-$100 monthly internet rates currently charged by AT&T and Comcast. They noted that there are other competitors in the County such as Cruzio, which has a great reputation, but its service area is limited, and it uses AT&T infrastructure.

City staff also noted that some households are choosing to stop using traditional "cable" services for TV like Comcast or DirectTV and are opting to use smart devices or computers to stream. As a result, services require greater capacity and speeds to accommodate the increased Wi-Fi demands.

Needs and planning

City officials said that the County needs to work in partnership with the individual cities, who will determine how buildouts will occur and how they will be supported. Officials also felt that the County should require the ISPs to send over data that defines what areas of the County they serve, to include internet speeds, and price points. Participants said that County and the City need to ensure competition within this market to motivate ISPs to invest in their infrastructure, reducing the incidents of outages, providing better services such as those already available in the Bay Area and competitive pricing with discounted rates for low-income families.

Higher education

Representatives from the University of California Santa Cruz (UCSC) and Cabrillo College (Cabrillo), the two primary higher education institutions in the County, participated in a joint interview. A representative from Digital Nest also joined the conversation. Included in the discussion were Rick Harden, Director of Information Technology at Cabrillo; Byron Walker, Associate Vice Chancellor of Infrastructure and Architecture at UCSC; Mark Beach, Senior Manager of Network Infrastructure at UCSC; and Matt Payne, Board Member of Digital NEST.

UCSC's main campus is in the north part of the County, with satellite locations in the lower West Side of town and another campus in Monterey County. Cabrillo's main campus is located in Aptos, with a satellite campus in downtown Watsonville.

UCSC has nearly 20,000 students, most of whom are on the main campus. The UC system would like to increase the student population by an additional 10,000 students in the next 10 years. Cabrillo currently has just under 10,000, 33 percent of whom are full-time. Since the pandemic, both UCSC and Cabrillo also deal with a large portion of remote workers.

Challenges

Both higher education institutions are concerned about sufficient bandwidth to support growth. They rely on the CENIC network, which connects education and research institutions to each other throughout the state. Cabrillo is concerned that the CENIC network is built upon AT&T's aging infrastructure, causing even AT&T fiber to be unreliable and making upgrades very slow.

Despite challenges with CENIC, Cabrillo believes it is well served and has redundant links for both the Aptos and Watsonville campuses. Cabrillo IT is also exploring the possibility of alternative fiber through Charter Spectrum. Currently Cabrillo purchases services directly with AT&T and also purchases services under a different contract between CENIC and AT&T. Because CENIC is also working with Charter, Cabrillo may work more with Charter for future services. It has also been a challenge to accommodate a significant number of remote workers.

UCSC claims its current network is at approximately 70 percent capacity. The campus and its surrounding area are well served. UCSC currently has two 100 GB circuits and is considering adding another through CENIC. The university is looking for physical redundancy and diversity which the main campus has but not their locations in the mountains. It is working with Crown Castle to purchase other services to increase diverse routing and redundancy.

UCSC will need to increase in capacity to accommodate the planned growth of the student population in the coming years. With this increase in capacity it can continue, and perhaps increase, the space on its infrastructure that is leased to providers.

It was a significant challenge to keep remote workers connected during the weather events in the winter of 2023. High winds and extreme weather caused fiber to be pulled off poles, resulting in outages for telecommuters.

Digital NEST is a nonprofit that provides training programs and career preparation for teens and young adults pursuing jobs in technology. The biggest challenge is that many students who are members of Digital NEST do not have devices or connectivity at home, making it difficult to conduct training with these students and for students to complete homework or projects. During the pandemic students were provided hotspots and devices. Affordability of service is also an issue for students that participate in Digital NEST and who live in affordable housing, multi-dwelling units (MDUs) in low-income neighborhood or farmworker housing communities.

Opportunities

Cabrillo recently received an NTIA Connecting Minority Communities (CMC) grant of $3 million for two to three years. The CMC grant will fund devices and connectivity for 140 underserved students, including an assessment of home access. It may consider using Starlink for services. Most of the students participating in the CMC program are located in South County. Cabrillo hopes to apply the learnings from this grant program to continue its work to serve students in

need. Cabrillo also discussed relationships with K-12 partners and UCSC services to achieve student success.

UCSC discussed the efforts by its student services and the Vice Chancellor for Student Success to provide affordable devices and services to students through kiosks on campus to give away laptops for use on campus and grants for discounted services and devices.

Both also mentioned efforts to migrate information housed in their data centers to the cloud and will rely on CENIC to upgrade the network to enable them to make this transition.

Both Cabrillo and UCSC expressed interest in partnering with the County and stated that previous efforts were hampered by a lack of resources. Partnership efforts could include outreach efforts, remote staff support, engineering, and grant writing.

K-12 education and libraries

CTC and the County met with Jason Borgen, Chief Technology and Innovations Officer at the Santa Cruz County Office of Education and Yolande Wilburn, Director of Santa Cruz Public Libraries.

The Santa Cruz County Office of Education (COE) serves approximately 36,000 students through its multiple school districts. The COE uses the CENIC backbone with two dedicated 10 GB pipes and each district has point-to-point fiber line back to the COE infrastructure. COE needs a colocation facility for redundancy as its data center was threatened during the CZU Lightning Fires in 2020. Local independent ISP Cruzio has partnered with the COE and provides wireless capabilities at the individual school sites, including a wireless project that provides service into the surrounding neighborhood from equipment on a school property.[93]

Libraries have been offering hotspots for checkout and have participated in a Digital Navigator Program to help residents enroll in low-cost broadband programs. Navigators are assigned within 24 hours of a customer request, and in addition to finding discounted services, they also assist with finding resources for digital literacy skills and affordable devices.

The library system had to close several branches, such as the Boulder Creek location, that were impacted by multiple natural disasters that have occurred in the County. There is a plan to create a new downtown library which will be completed in 2027. However, there will not be space in that location for a data center so it will move to its administration building. The library will add more backup power to the administration building to accommodate the data center.

[93] "An Update on Equal Access Santa Cruz" (September 18, 2023) https://cruzio.com/2023/09/an-update-on-equal-access-santa-cruz/.

Challenges

Broadband access and knowledge about affordable options is the biggest challenge for K-12 families. The COE has started collecting data on device ownership, internet access at home, hotspot usage, and service providers for students' families.

The biggest issue for the library system is outdated infrastructure that cannot support needed speeds and capacity, such as outdated wiring and equipment. The library system has gotten funding for updates.

The library also needs to keep branches open and in operation in case of emergencies. All of the branches lost power in the recent 2023 winter storms and had insufficient back-up systems. It has taken several weeks to put them back in operation. Libraries also advocate for the fairgrounds to be equipped with the infrastructure to serve during emergencies.

As mentioned above, the servers will be moved to the administration building with a back-up generator. For communities impacted by disasters, the library is the main source of connectivity when it is not available in homes.

Opportunities

Both the COE and the library representatives agreed that the primary unserved or underserved areas of the County were in San Lorenzo Valley (including Boulder Creek, Felton and Ben Lomond), Scotts Valley, Davenport, Bear Creek Road, the Soquel and Aptos hills and the County fairgrounds. Although Beach Flats is also an area of concern, the issue is more with affordability and digital literacy than with access.

The libraries' Strategic Plan calls for community conversations and surveys in the fall of 2023 to gather feedback from residents. Schools are asking families questions about broadband access in the school registration packets and has been processing the data.

The COE is participating in the Digital Divide Grant Program through the CPUC, which provides grants for student access to broadband at home, personal devices, and digital skills training. It is also participating in the School2Home Program sponsored by the Silicon Valley Education Foundation and the California Emerging Technology Fund (CETF). The libraries work with CENIC to qualify for E-Rate through the CA State Library grant program. This work with the State Library gives the library system discounts on services.

The COE is working with schools to deploy a satellite phone system as a form of backup and is working to expand FirstNet. Another opportunity for future buildouts for both these groups is the California Middle-Mile Broadband Initiative, which will be constructed along Highway 9, Highway 17, and Highway 1 up to Davenport.

Appendix C: Business and nonprofit online survey

Serving the Community | Working for the Future

COUNTY OF SANTA CRUZ

Santa Cruz County Business and Nonprofit Survey

The County of Santa Cruz is in the process of developing a Broadband Master Plan. We are assessing areas of the County that are unserved and underserved by broadband infrastructure and developing recommendations for deployment while leveraging potential federal and state funding streams. Part of the process includes gathering data from stakeholders from a variety of organizations who can help us determine the greatest areas of need and gaps for future County development and growth.

Please complete this brief survey to help us gather important information for improving broadband coverage in the County.

* 1. Please provide your contact information.

Name of organization	
First and last name	
Title	
Email	
Phone number	

2. Please give us a sense of the geography you serve.

- ◯ County-wide
- ◯ City-wide
- ◯ Neighborhood-wide
- ◯ Unincorporated areas
- ◯ Other (please specify)

3. What is your industry?

- ◯ Healthcare
- ◯ Food industry
- ◯ Transportation
- ◯ Finance
- ◯ Construction or manufacturing
- ◯ Entertainment
- ◯ Agriculture
- ◯ Real estate
- ◯ Technology
- ◯ Sales
- ◯ Education
- ◯ Other (please specify)

4. What types of constituents do you serve?

5. How important is broadband to your work?

Not important - 1	2	3	4	Critically important - 5
◯	◯	◯	◯	◯

6. How does your organization rely on broadband services to serve clients or customers?

7. Do you think that businesses in the County generally have robust broadband with enough bandwidth?

- ◯ Yes
- ◯ No
- ◯ Not sure

8. Do you have affordable and reliable connectivity required for you to conduct business and serve your clients/customers?

- ◯ Yes
- ◯ No

9. Who is your internet service provider?

- ◯ AT&T
- ◯ Comcast (Xfinity)
- ◯ Charter
- ◯ Cruzio
- ◯ Surfnet
- ◯ Razzolink
- ◯ Frontier
- ◯ Sonic.net
- ◯ Don't know

10. Are there parts of the County where broadband service is unaffordable to businesses and is impeding economic growth?

- ◯ No
- ◯ Not sure
- ◯ Yes; if so, where

11. To your knowledge, do your employees and/or the constituents you serve have adequate internet service at home?

- ◯ Yes
- ◯ No

12. Where do you think are the biggest problem areas?

- ☐ City of Santa Cruz
- ☐ Watsonville
- ☐ Scotts Valley
- ☐ Aptos
- ☐ Aptos Hills
- ☐ Corralitos
- ☐ Bonny Doon
- ☐ Davenport
- ☐ Live Oak
- ☐ Soquel
- ☐ Capitola
- ☐ San Lorenzo Valley

13. What role should the County be taking in the expansion and build out of broadband access in the region?

14. Would you be willing to participate in a follow-up discussion about Santa Cruz County's broadband needs?

- ◯ Yes
- ◯ No

Appendix D: Residential phone survey instrument

Santa Cruz County - Residential Survey

Hello, my name is ____. I'm calling on behalf of the County of Santa Cruz. They are seeking your help to improve internet accessibility and affordability throughout the County. The information gathered will not be used to sell you anything and your responses will be kept strictly confidential. We will not ask you for your name or other identifying information.
Even if you do not have home internet service, please answer the relevant questions as your opinions are important to us.

1. Please input the phone number.

2. Are you age 18 or older?

- ◯ Yes
- ◯ No [Ask for someone else in the household who is over 18]
- ◯ Refuse [Thank and terminate]

First, we have a few questions to understand what kinds of internet services you use and subscribe to.

3. Does your household receive home internet service - not mobile data?

- ◯ Yes
- ◯ No

4. Does your household purchase home internet service from an internet service provider?

- ◯ Yes
- ◯ No

5. We understand that you don’t purchase a home internet service. If you access the internet at home in other ways, which of the following about your service at home is correct:

- [ ] My household uses Cellular/mobile connection
- [ ] My household uses a mobile hotspot, provided to us by a school, library, or other party
- [ ] My household uses free Wi-Fi in the building or from a neighbor
- [ ] I don't have any internet service at my home
- [ ] I don't know

6. What are the reasons why your household does not purchase home internet service? Please say yes, no, or don't know to the following statements [Check only where respondent says yes] [If they select the first option, do not select anything else and continue to next page]

- [ ] I am able to receive free internet service at home
- [ ] My cellular/mobile connection is sufficient for me
- [ ] I don't need or am not interested in home service
- [ ] I cannot afford it
- [ ] It's not worth the cost
- [ ] I can receive internet service outside my home
- [ ] Home internet service is not available in my area
- [ ] I do not have a computing device, or the device is inadequate or broken
- [ ] Online privacy or cybersecurity is too high a risk
- [ ] I have serious personal safety concerns
- [ ] My household recently moved or is in the process of moving
- [ ] Not applicable
- [ ] Other (please specify)

7. Of the reasons you picked for not purchasing a home internet service, which do you and the members of your household consider to be the most important? [If needed, read reasons that respondent gave; select best mast or enter verbatim response if other]

- [ ] I am able to receive free internet service at home
- [ ] My cellular/mobile connection is sufficient for me
- [ ] I don't need or am not interested in home service
- [ ] I cannot afford it
- [ ] It's not worth the cost
- [ ] I can receive internet service outside my home
- [ ] Home internet service is not available in my area
- [ ] I do not have a computing device, or the device is inadequate or broken
- [ ] Online privacy or cybersecurity is too high a risk
- [ ] I have serious personal safety concerns
- [ ] My household recently moved or is in the process of moving
- [ ] Other reason that I listed

8. Who is the service provide of your home internet service? Please choose one.

- ◯ Comcast (Xfinity)
- ◯ AT&T
- ◯ Cruzio
- ◯ Charter (Spectrum)
- ◯ Surfnet
- ◯ Razzolink
- ◯ Etheric
- ◯ Frontier
- ◯ Sonic
- ◯ Do not know
- ◯ Other (please specify)

9. What do you think are the most important aspects of your home internet service that need to be improved in Santa Cruz County? [ask for top 2]

- ☐ We need more choices of service providers in my location
- ☐ My service provider needs to provide faster service
- ☐ My service provider needs to provide cheaper service
- ☐ My connection needs to be more reliable—fewer drops in coverage
- ☐ My connection needs to be more reliable—fewer outages of service
- ☐ Other (please specify)

10. How reliable is your home internet service? For example, unreliable service could mean that the service is not available, or experience sudden drops in speed.

- ◯ Not at all reliable
- ◯ Slightly reliable
- ◯ Moderately reliable
- ◯ Very reliable
- ◯ Extremely reliable
- ◯ Unsure

11. In the past 6 months, has your household experienced internet connectivity problems with your home internet service during a severe weather event? (For example, did you experience slower than normal service, short-term or long-term outages or multiple outages in a day during or immediately after a storm or other weather event?

- ◯ Yes
- ◯ No

12. Are you currently enrolled in the Affordable Connectivity Program, Lifeline, or a subsidy program offered by your Internet Service Provider? [if needed, give background dialogue on ACP: The Affordable Connectivity Program is federal subsidy program providing up to $30 per month for a fixed home internet subscription to qualifying households] Please indicate with a **yes** if any of the following apply.

- ☐ Affordable Connectivity Program (ACP)
- ☐ Lifeline
- ☐ No subsidy programs
- ☐ Unsure
- ☐ Internet Service Provider offered subsidy program

13. What entities do you trust to receive useful information about discounted internet services or government subsidy programs for home internet? [if they pick the 2nd option, ask Q14; if not skip to Q15]

- ◯ **Government agencies** (such as your city or county government or other agencies that provide social services at the state or county level)
- ◯ **Local community organizations** (such as a neighborhood center, library, school, or church)
- ◯ **Media and news** (including resources from the internet)
- ◯ **Advertisements from internet service providers** (including resources from the internet)
- ◯ I am not interested in information about discounted or subsidized home internet programs.
- ◯ I do not believe I qualify and therefore do not need information about discounted or subsidized programs

14. Please specify which community organizations you rely on for useful information.

15. Please estimate how much you pay per month for your home internet service.

- ◯ $0 - $19
- ◯ $20 - $39
- ◯ $40 - $59
- ◯ $60 - $79
- ◯ $80 - $99
- ◯ $100 or more
- ◯ Unsure

16. Is the price mentioned in the previous question a price that includes TV and/or phone?

- ◯ Yes
- ◯ No
- ◯ Unsure

17. Please estimate what you believe is a reasonable price to pay per month for high-speed, reliable home internet service.

- ◯ $0 - $19
- ◯ $20 - $39
- ◯ $40 - $59
- ◯ $60 - $79
- ◯ $80 - $99
- ◯ $100 or more
- ◯ Unsure

To use the internet, people need devices like laptops or smartphones. This next question is about what types of devices you have and how well they work.

18. For each of the following devices, how many does your household use that are in good working condition? Laptop or desktop computer, tablet, smartphone.

Computer (laptop or desktop)	
Tablet	
Smartphone	

To make the best use of the internet, people need a range of skills in using computers and navigating websites. These next few questions are about digital literacy and digital skills.

19. Please rate how confident you or the primary user are in doing the following activities on the internet:

	Not confident	Slightly confident	Very confident	Not applicable
Sending and receiving emails?	○	○	○	○
Using social media?	○	○	○	○
Participating in online video, voice, or conference calls (such as Zoom, Skype, or FaceTime)?	○	○	○	○
Operating a small (home-based) business?	○	○	○	○
Working remotely and telecommuting?	○	○	○	○
Searching for a job online?	○	○	○	○
Taking classes or participating in online job training?	○	○	○	○
Accessing medical services or resources?	○	○	○	○
Accessing governmental services (such as DMV, benefits enrollment, etc.)?	○	○	○	○
Shopping, making travel reservations, or using other online consumer services?	○	○	○	○
Accessing online financial services such as banking and paying bills?	○	○	○	○

20. To what extent do you agree or disagree with the following statements about your internet and computer skills?

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
I can use and adjust privacy settings on social media.	◯	◯	◯	◯	◯
I can identify false or misleading information.	◯	◯	◯	◯	◯
I can recognize and avoid online fraud (or phishing schemes).	◯	◯	◯	◯	◯

The remaining questions are meant to capture household demographic information. This information will be anonymized so you cannot be individually identified.

21. What is your age?

22. How many people live in your household, and what are their approximate ages?

Under 18	
18-29	
30-39	
40-49	
50-64	
65+	

23. What is your approximate annual household income? [Begin to read answers]

- ◯ Less than $25,000
- ◯ $25,000 to $49,999
- ◯ $50,000 to $74,999
- ◯ $75,000 to $99,999
- ◯ $100,000 to $124,999
- ◯ $125,000 to $149,999
- ◯ $150,000 to $174,999
- ◯ $175,000 to $199,999
- ◯ $200,000 or more
- ◯ Prefer not to answer

24. What races/ethnicities are represented in your household? [Check all that they mention, do not read answers]

- ◯ Black/African American
- ◯ Asian/Asian American
- ◯ Hispanic/Latino
- ◯ Native American/Indigenous American
- ◯ White
- ◯ Middle Eastern/Arab American
- ◯ Native Hawaiian/Pacific Islander
- ◯ Prefer not to answer

25. Are you or anyone else living in your household a(n): [Read and check all that apply]

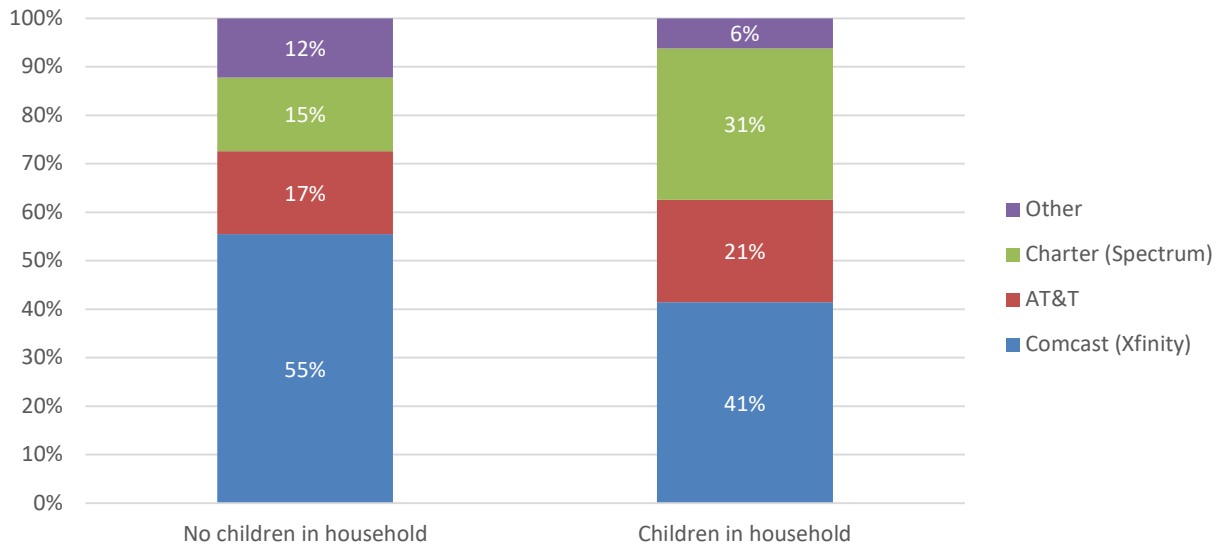
- ☐ Veteran
- ☐ Individual with a disability
- ☐ Primarily non-English speaker
- ☐ Formerly incarcerated individual
- ☐ Actively enrolled in K-12 school or college or other higher education - DO NOT USE THIS
- ☐ actively enrolled in K-12 school
- ☐ enrolled in college or other higher education

Appendix E: Additional survey data

Internet service providers by household type

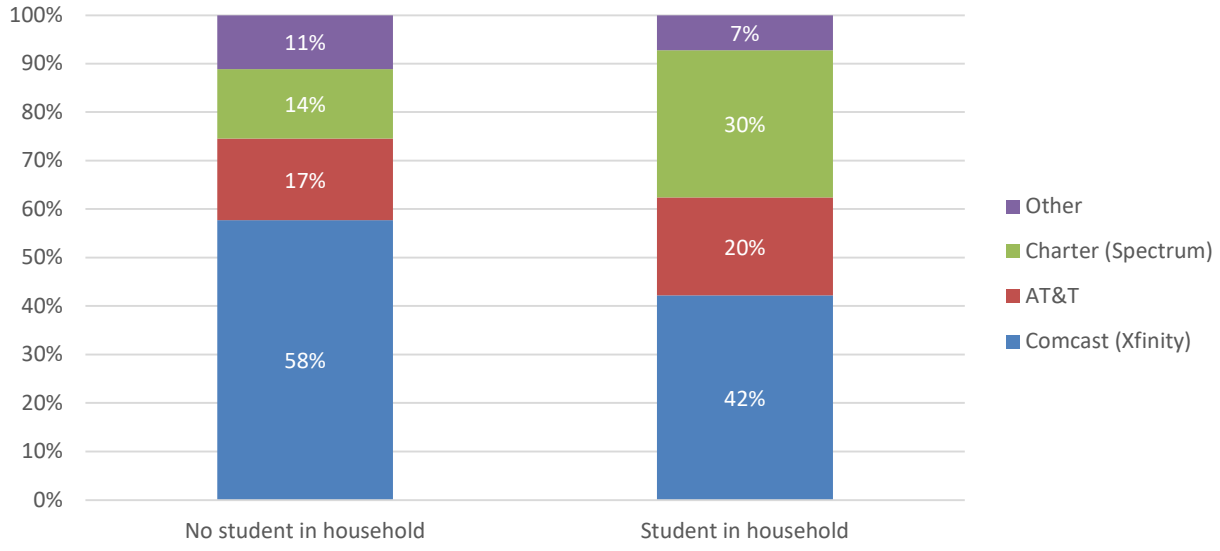
Although Comcast/Xfinity is the leading home internet provider overall, households with children are less likely than those without children to subscribe to this provider, and they are more likely to subscribe to Charter (Spectrum), as shown in Figure 59.

Figure 59: Home internet service provider by children in household



Similarly, households with any K-12 or higher education student are more likely than those without students to subscribe to Charter/Spectrum (see Figure 60).

Figure 60: Home internet service provider by student in household



Internet connectivity problems by household type

Households with seniors and without children were more likely than their counterparts to have experienced an internet connectivity problem during severe weather, as illustrated in Figure 61 and Figure 62.

Figure 61: Internet connectivity problems by children in household

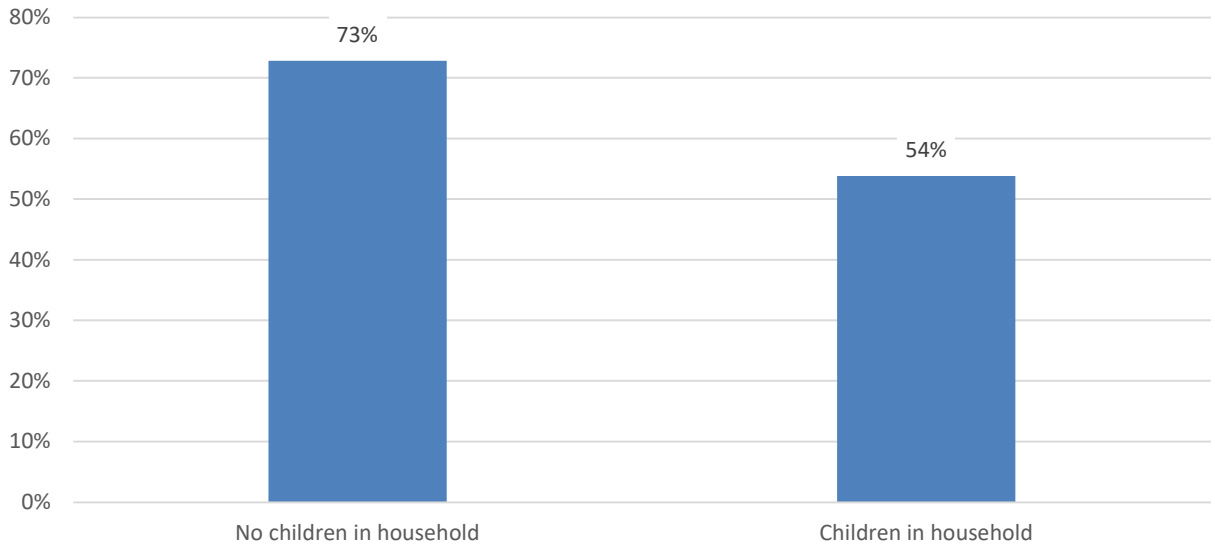
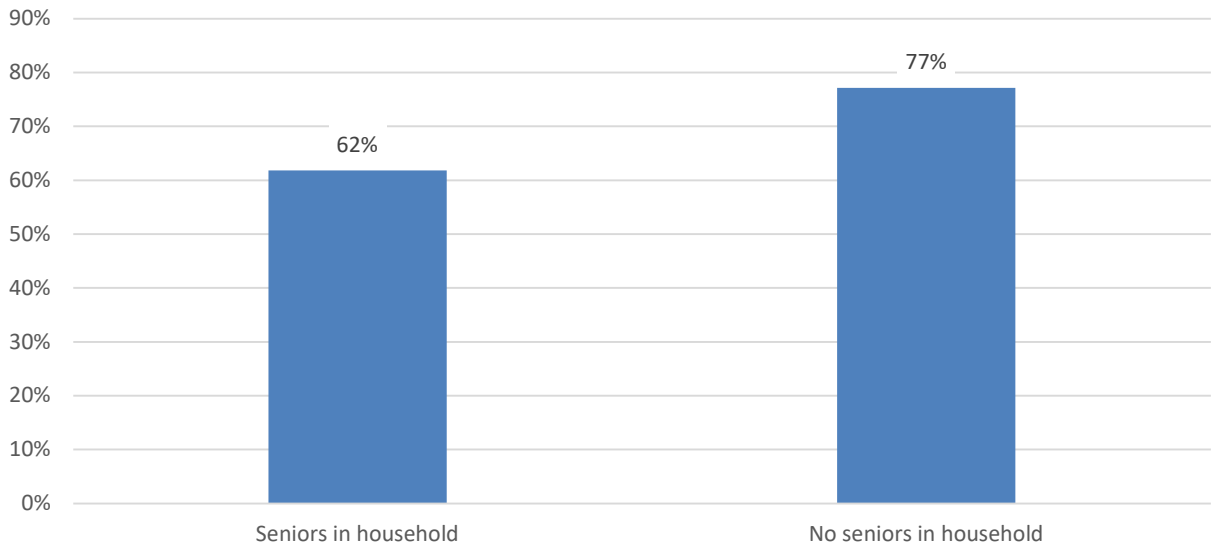


Figure 62: Internet connectivity problems by seniors in household



Confidence in computer and internet skills based on household composition

Although based on a relatively small subsample of respondents, those with a veteran in the household and those with an individual with a disability in the household indicated they or the primary user are less confident in their internet and computer skills, as shown in Table 28.

Table 28: Confidence in internet and computer skills for households with at-risk member

		No veteran in household	Veteran in household	No individual with a disability in household	Individual with a disability in the household
Sending and receiving emails	Not confident	1%	6%	0%	14%
	Slightly confident	4%	3%	3%	10%
	Very confident	95%	92%	96%	76%
	Total	*354*	*44*	*359*	*39*
Using social media	Not confident	3%	18%	3%	22%
	Slightly confident	6%	3%	5%	10%
	Very confident	91%	78%	92%	68%
	Total	*332*	*39*	*336*	*34*
Participating in online video, voice, or conference calls (such as Zoom, Skype, or FaceTime)	Not confident	3%	11%	2%	20%
	Slightly confident	11%	17%	11%	13%
	Very confident	86%	72%	87%	67%
	Total	*322*	*35*	*319*	*39*
Operating a small (home-based) business	Not confident	7%	12%	5%	24%
	Slightly confident	25%	33%	26%	23%
	Very confident	68%	55%	68%	53%
	Total	*236*	*21*	*229*	*28*
Working remotely and telecommuting	Not confident	1%	14%	1%	20%
	Slightly confident	11%	18%	11%	14%
	Very confident	88%	67%	88%	66%
	Total	*268*	*28*	*269*	*28*
Searching for a job online	Not confident	2%	9%	1%	19%
	Slightly confident	3%	5%	3%	3%
	Very confident	95%	86%	96%	78%
	Total	*283*	*29*	*284*	*28*
Taking classes or participating in online job training	Not confident	2%	13%	1%	23%
	Slightly confident	8%	11%	7%	14%
	Very confident	90%	76%	92%	63%
	Total	*271*	*30*	*275*	*26*
Accessing medical services or resources	Not confident	3%	6%	2%	15%
	Slightly confident	6%	5%	5%	9%
	Very confident	92%	90%	93%	75%
	Total	*342*	*44*	*348*	*38*
Accessing governmental services (such as DMV, benefits enrollment, etc.)	Not confident	1%	6%	1%	11%
	Slightly confident	6%	5%	6%	10%
	Very confident	93%	89%	93%	79%
	Total	*344*	*41*	*350*	*35*
Shopping, making travel reservations, or using other online consumer services	Not confident	2%	10%	1%	13%
	Slightly confident	2%	3%	3%	2%
	Very confident	96%	87%	96%	85%
	Total	*345*	*42*	*350*	*37*
	Not confident	1%	6%	1%	10%

Accessing online financial services such as banking and paying bills	Slightly confident	3%	8%	4%	2%
	Very confident	96%	86%	95%	88%
	Total	*349*	*43*	*353*	*38*

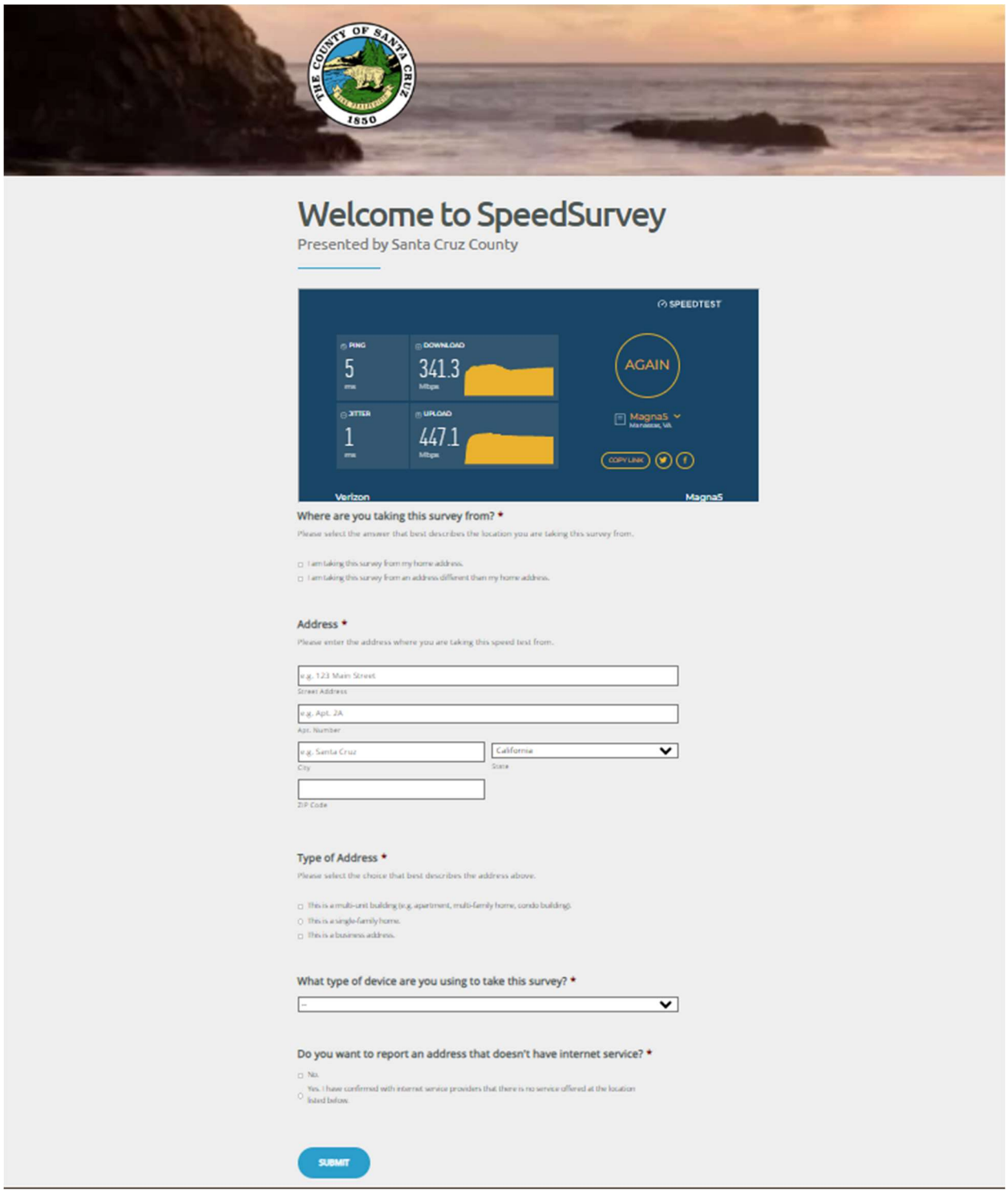
Internet skills by household size

As shown in Table 29, respondents who live alone were somewhat less likely to agree they are skilled in various internet uses compared with those who live with other household members.

Table 29: Agreement with statements about internet skills by household size

		One HH member	Two HH members	Three HH members	Four+ HH members
I can use and adjust privacy settings on social media.	Strongly disagree	5%	6%	5%	10%
	Disagree	5%	7%	3%	3%
	Neutral	27%	10%	6%	7%
	Agree	38%	55%	59%	49%
	Strongly agree	25%	21%	28%	31%
	Total	*85*	*141*	*80*	*78*
I can identify false or misleading information.	Strongly disagree	1%	0%	0%	0%
	Disagree	3%	0%	2%	2%
	Neutral	26%	12%	8%	9%
	Agree	46%	67%	62%	52%
	Strongly agree	24%	21%	28%	37%
	Total	*82*	*141*	*80*	*78*
I can recognize and avoid online fraud (or phishing schemes).	Strongly disagree	0%	0%	0%	0%
	Disagree	3%	1%	2%	2%
	Neutral	27%	10%	7%	10%
	Agree	53%	69%	62%	51%
	Strongly agree	18%	20%	29%	36%
	Total	*82*	*141*	*80*	*78*

Appendix F: Speed test survey



Welcome to SpeedSurvey

Presented by Santa Cruz County

Where are you taking this survey from? *

Please select the answer that best describes the location you are taking this survey from.

- ☐ I am taking this survey from my home address.
- ☐ I am taking this survey from an address different than my home address.

Address *

Please enter the address where you are taking this speed test from.

e.g. 123 Main Street
Street Address

e.g. Apt. 2A
Apt. Number

e.g. Santa Cruz
City

California
State

ZIP Code

Type of Address *

Please select the choice that best describes the address above.

- ☐ This is a multi-unit building (e.g. apartment, multi-family home, condo building).
- ○ This is a single-family home.
- ☐ This is a business address.

What type of device are you using to take this survey? *

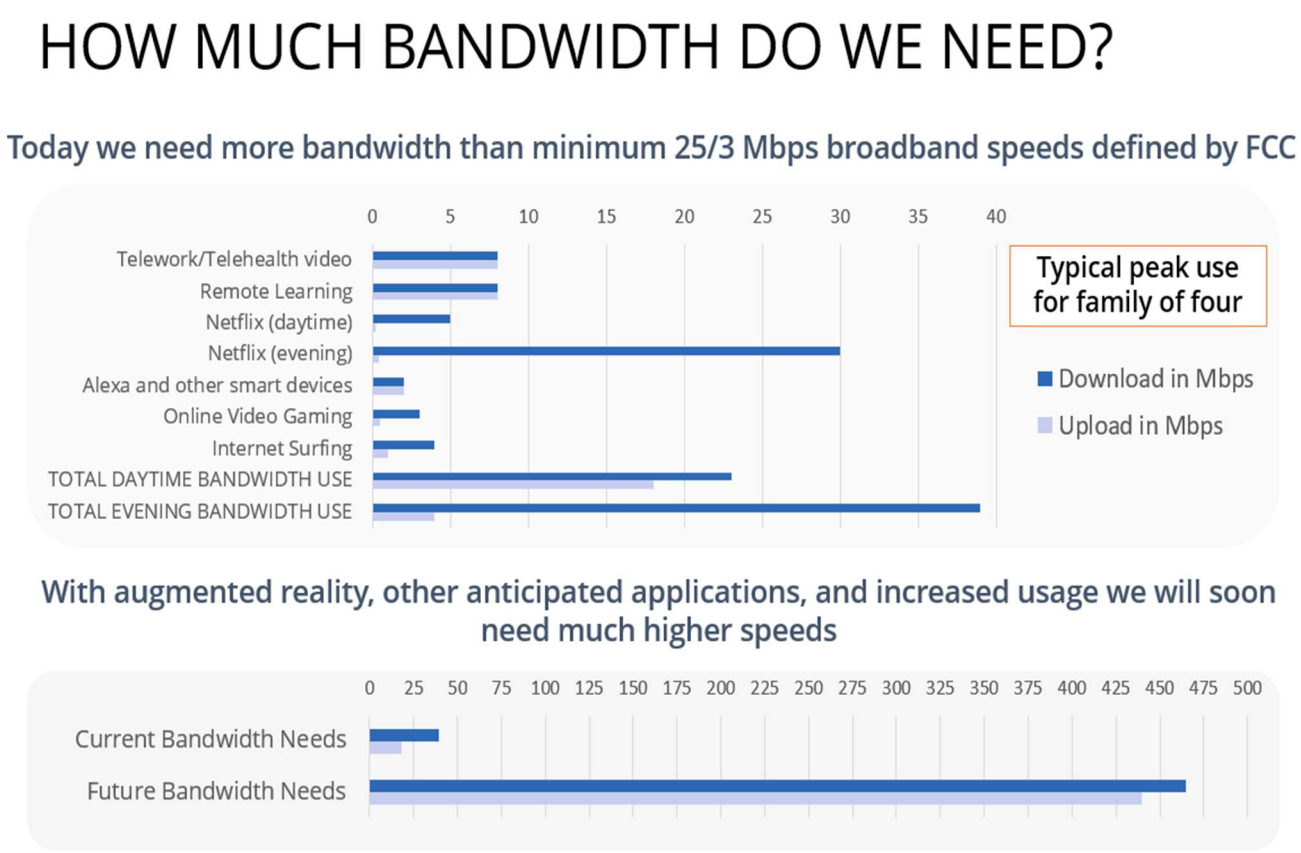
--

Do you want to report an address that doesn't have internet service? *

- ☐ No.
- ○ Yes. I have confirmed with internet service providers that there is no service offered at the location listed below.

SUBMIT

Appendix G: Broadband bandwidth guide for a family of four



Appendix H: An overview of the Grant Funding Optimization (GOeS) Tool

CTC has developed a Grant Funding Optimization Tool referred to as the GOeS Model, that provides extensive analysis of the economics of a wide range of technology configurations for deploying broadband. This sophisticated financial model provides multiple, data-based scenarios that highlight the implications of various technology and grant strategy choices, as well as the likely tradeoffs.

The resulting scenarios can serve to inform policymakers and assist in the development of financial and business decisions to best position Santa Cruz County for upcoming BEAD funding in 2024, and are designed to answer the critical questions posed in developing a plan to serve all underserved and unserved premises in the County, such as:

1. How much of the set of challenges will be addressed by the available funds
2. The cost implications of various technology and infrastructure choices, as well as the cost of certain kinds of policy choices
3. The subsidy level the County should expect in order to receive bids for funds in project areas
4. Based on an economic shortfall analysis, the project areas that may require subsidy above and beyond the BEAD funding that could be assigned to the county
5. The extent to which project areas will require more than 100 percent of capital subsidy in the form either of an additional up-front payment or a periodic operating subsidy to attract bids
6. Given the County's policy priorities, the capital cost where the County should set its Extremely High Cost Per Location Threshold, above which, fixed wireless or satellite can be used instead of fiber
7. Overlaying census data on the scenario maps to demonstrate how potential scenarios for technology distribution align with demographic factors

Examples of scenarios developed by the GOeS model include:

- **Baseline scenarios**:
  - Building fiber to the premises (FTTP) to all unserved homes
  - Building FTTP to all unserved and underserved homes

- **Maximum efficiency scenarios:**
  - Building FTTP to all unserved homes, absent match, reimbursement, and allowing funding of operating expenses

  - Building FTTP to all unserved and underserved homes, absent match, reimbursement, and allowing funding of opex

- **Technology Mix Scenarios:**
  - Assumes local boundaries and extensions from existing infrastructure.
  - Assumes local boundaries and construction of a standalone network.
  - No local boundaries

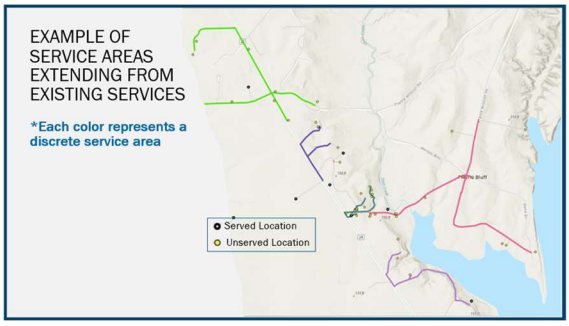
For each of the scenarios (excluding the base scenarios), the GOeS model will determine:

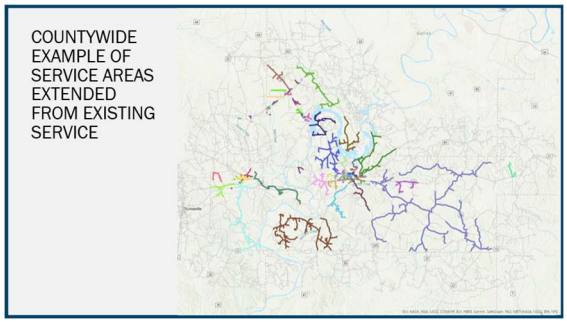
- The Extremely High Cost Per Location Threshold (EHCPLT) per location that will serve as the point where fixed wireless or satellite can be used instead of FTTP
- How the technology distribution aligns with various demographic factors, through American Community Survey data overlaid on the scenario maps

The GOeS model develops these scenarios by using a wide variety of parameters that are extracted from a variety of sources including FCC fabric datasets, publicly available and subscription datasets, user generated financial inputs, desk surveys, field surveys and other data sources where readily available.

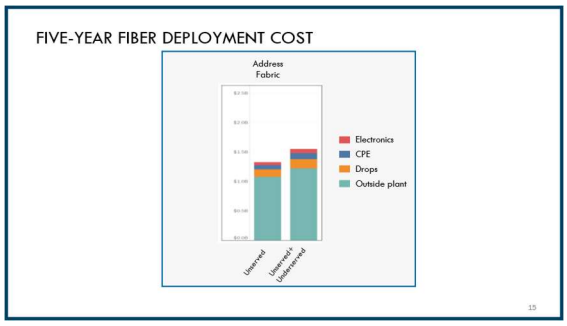
Samples of reporting produced by the GOeS Model are provided below.

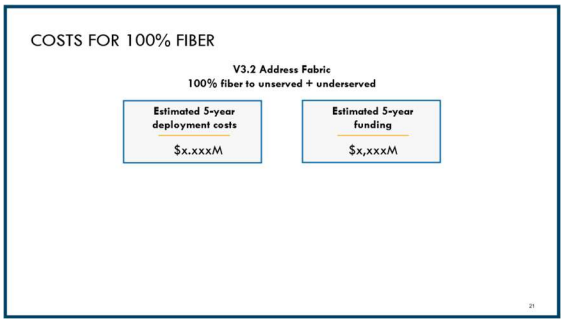
Example 1. Service extension scenarios





Example 2. Fiber deployment cost and funding scenarios





Example 3. Technology mix costs, allocation, extremely high-cost threshold per location (EHCTH) and required match scenarios