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Broadband Feasibility Study

Prepared for:

Hidalgo County, TX

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1 EXECUTIVE SUMMARY AND RECOMMENDATIONS

Broadband networks, while once an emerging technology and luxury service, today can be looked at as the fourth utility alongside water, gas, and electricity[1]. It is critical to the functionality of everyday needs, providing access to information, increasing home safety, and enhancing the overall quality of life. It is also still a technology, evolving in its form and function and inspiring innovation in its application as a foundational aspect of other technological advancements.

Internet options are available through many modern technologies. The technologies most recommended for future-proofing are fiber-to-the-premise (FTTP), licensed fixed-wireless, and hybrid fiber-coaxial cable. Out of these options, the most desirable option, where possible, is fiber.

"We don't really know the upper bounds of a fiber wire yet…we're still discovering that. Copper is pretty much obsolete. Cable is hitting an upper limit that we will likely meet within the next decade. Fiber could probably meet our needs for the next 30 years, if not 50." said Chao Jun Liu, a legislative associate at the Electronic Frontier Foundation.[2]

This is the most adaptable solution for future-proof growth, and currently provides the fastest speeds for the end user. However, due to cost, population density, or other external factors, it may not be a feasible solution in all areas. Through a fiber- based core network in the Middle Mile, licensed fixed-wireless options are also an adequate option for future-proof internet, as well as a hybrid approach where a fiber-optic backbone reaches the end user through a co-axial output.

Hidalgo County contracted CobbFendley, an Infrastructure Solutions firm specializing in civil engineering and surveying, to provide a Broadband Access Study and Expansion Plan (referred to as a Broadband Feasibility Study) to better understand the existing internet infrastructure coverage across the County and determine where it can be improved for both residential and business needs.

With assistance from Jordana Barton-Garcia, a local champion who drives investments of broadband advancement to underserved communities within the Rio Grande Valley (RGV), Nathan Watkins, a southeast Texas independent consultant with experience in municipal owned networks and broadband cost benefit analysis, and finally Brownstone Consultants, a McAllen-based construction firm with a history of RGV broadband implementation, the goals are to improve broadband service levels for unincorporated areas that meet the criteria of underserved or unserved.

The study focused on bridging the digital divide within all of Hidalgo County with special attention to areas of the County that are unincorporated, and underserved or unserved by internet connectivity. The goal of the study will be to maximize the use of County resources with federal, state, and localized grant funding, while improving the access to broadband services for the underserved and unserved citizens of Hidalgo County. Furthermore, the expansion plan details potential measures and processes that will maintain the momentum of this initiative into the pre-implementation planning and implementation phases.

1.1 Scope of Work

The scope for performing the study included:

- Working with Hidalgo County to develop a regional stakeholder team, strategic partnerships from various industry sectors, and create the organizational structures for the implementation of the plan
- Defining the process to identify broadband assessment of services and gaps which will include the collection and analysis of data based on the current competitive environment to include existing fiber networks and all other Broadband providers and services within the County, pricing strategies, speed, coverage area, and availability or use by other network providers (providers to include wired, fixed wireless, cellular and satellite)

[1] Rethinking the Fourth Utility Connectivity Conundrum (bbcmag.com)
[2] Velazco, C. (2022, April 8). How fiber might replace America's lousiest Internet connections - The Washington Post. Washington post. https://www.washingtonpost.com/technology/2022/08/04/what-is-fiber-internet-explained-infrastructure/

- Create a mapping of routes and locations for fiber and broadband internet infrastructure, providers, facilities, and other equipment in a format usable by GIS systems
- Identify community readiness/barriers to address gaps
- Complete County Broadband Access Study with coverage and gap maps by service area
- Complete County infrastructure development plan with recommendations and cost estimates to include scenarios for building our new and expanded networks through open access, proprietary networks, or combination to include financing options, legal requirements, risks, and regulations relevant to building/operating networks and partnership agreements
- Provide Hidalgo County with data for their submission of all required written reports

CobbFendley's approach to performing the scope of work, as described earlier and in the County's RFQ, has been forged through our experience in performing similar studies for over 60 other municipalities. While our process has been streamlined, our goals for the study are to always to provide unique insight and a catered report, detailing specifics that apply only to Hidalgo County.

We have fulfilled this scope by developing a Needs and Gap Analysis, consisting of market research, stakeholder, and public engagement. Based upon our findings, we have worked to develop a Network Strategy, assessing technology feasibility and network design. Finally, we identified scalable and modular business models, performed a cost and funding analysis, and developed an implementation plan to round out the study and consolidate into this report.

1.2 Project Discoveries

Throughout the course of this project and development of the final report, we have identified key findings and observations which provide the framework for our analysis and recommendations. These highlighted factors are summarized below, categorized by the section of the reports which are further detailed.

Current State of Broadband

Hidalgo County's I-2 and I-69C/US281 corridors, effectively create a dispersion of population centers along the quadrant where development has occurred along these thoroughfares and immediately north and south of I-2 up to the County boundaries. Broadband infrastructure has followed other development and focused on these corridors, with the highest density of providers and quality of services in the urban centers, and a reduction of these moving outward, especially in the northwest and northeast corners of the County. Rural and unincorporated areas, including many Colonias, have limited access and options for high-speed broadband internet.

The following figures represent some of the core (trunkline) fiber networks that run throughout the County. The figure to the left represents long-haul networks, which typically do not break off to serve residential and commercial customers. The figure right next to it represents metro networks, which can be considered the "Middle Mile", extending the network closer to homes and businesses, but relying on "Last Mile" connections to provide services.

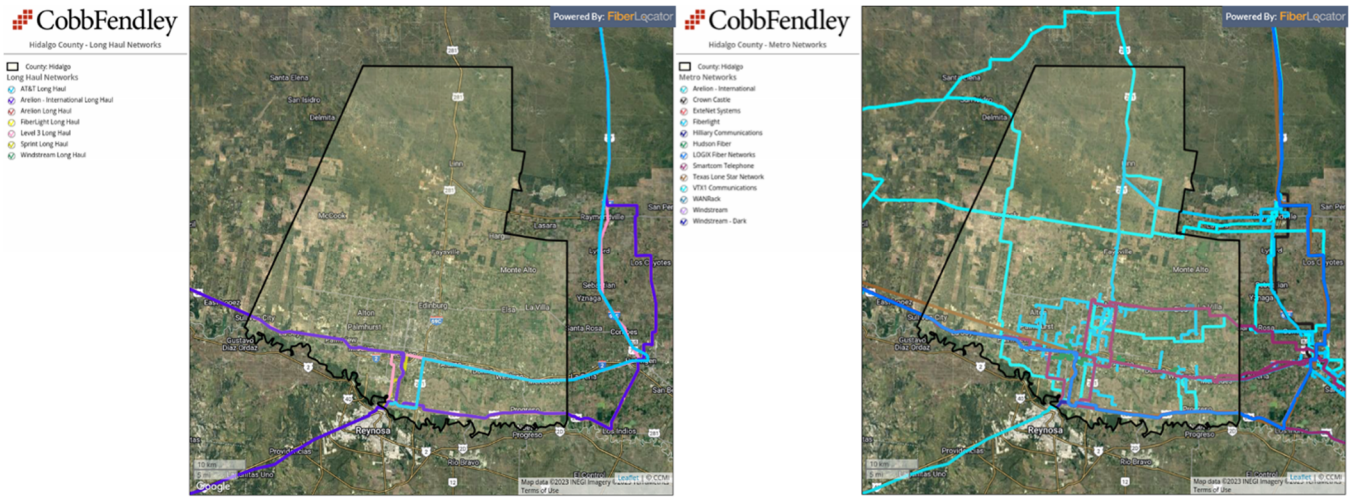

Figure 1: Fiber Locator Results in Hidalgo County

FCC fabric (addresses/locations) and availability (service provider coverage) data provided a basis for analysis of feedback from public outreach efforts through stakeholder engagement and public surveys. Most importantly, we can determine eligibility for grant funding and identify and challenge discrepancies based on review and processing of the FCC data sets and maps. Address classification of "Unserved" and "Underserved" areas are eligibility criteria which provide us insight as to the competitiveness that future grant application(s) would have, and which areas the grant(s) would concentrate on.

"Unserved" areas are classified as having internet speeds below 25 Mbps download and 3 Mbps upload (25/3 Mbps) followed by "Underserved" areas having internet speeds below 100 Mbps download and 20 Mbps upload (100/20 Mbps). Figure 2 displays these areas of need across Hidalgo County, based on FCC data. Hidalgo County is recorded as having 3,392 addresses (1.3%) of Underserved areas and 4,992 addresses (1.9%) being Unserved. These addresses are spread evenly throughout the County and are not limited to any one area or community. As shown in later figures, many of these addresses classified as Unserved or Underserved are in communities where ISPs state they have infrastructure or provide high-speed internet service.

Of note, there have been several iterations of FCC data and map updates, the latest of which reflects an extensive reduction of unserved and underserved addresses, with a complimentary increase of fiber and other internet service availability. While this trend appears to reflect a move in the right direction, there should be consideration that this could be a result of many factors such as improved reporting by internet service providers (ISPs), improved processing of data by the FCC and results of fabric challenges, or overreporting of coverage/availability, among many other factors.

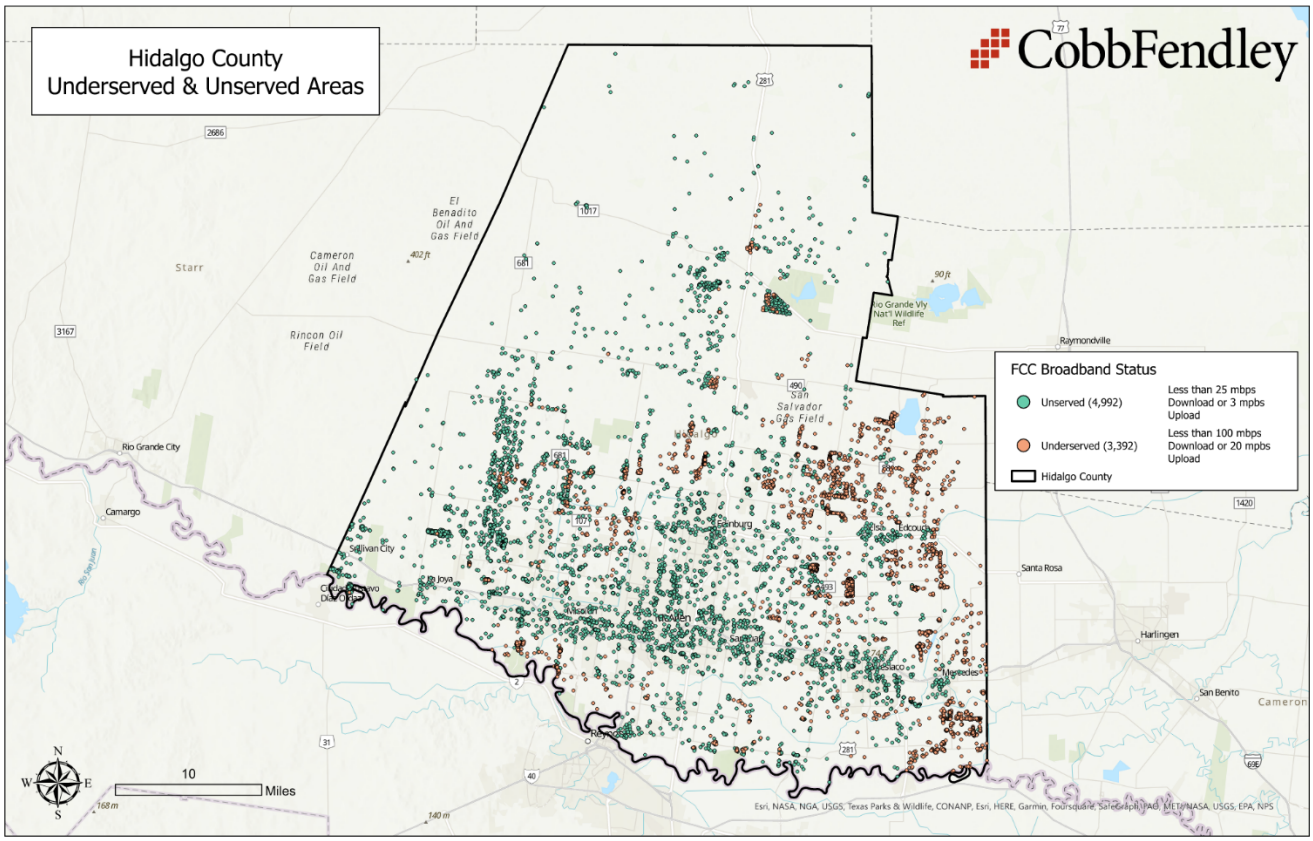

Figure 2: Unserved and Underserved Areas of Hidalgo County, TX

Apart from satellite-based options, there are seven residential internet service providers (see Table 4) using modern technologies/mediums that are available throughout the entire County, although not every option is offered at every address. Internet service providers are reporting, in Hidalgo County:

- 400,000+ addresses with access to Fiber to the Premise (FTTP)
- 240,000+ addresses with access to Coaxial or Hybrid Fiber/Coax
- 75,000+ addresses with access to Copper
- 450,000+ addresses with access to Licensed Fixed Wireless*
- All addresses have access to Satellite

**Licensed Fixed Wireless numbers have increased significantly over recent years with the expansion of mobile broadband services, those which provide data services to phones and tablets, providing homes and businesses with internet services.*

While alternative mediums/technologies may be the only options for extremely rural and sparsely populated areas from a cost-effective perspective, fiber is the primary recommended medium for new networks because it has the capacity and performance that provides a sustainable network foundation for growth and meeting the data requirements of the future. Fiber networks also meet the requirements set forth by many grant programs requiring 100/100Mbps (symmetrical) services.

Fortunately, there are many digital equity champions in the Rio Grande Valley who have recognized the unique challenges for the region in overcoming persistent poverty, lack of infrastructure in Colonias, and the practice of "digital redlining" areas that are seen as not worth investing in. Local leaders and initiatives have provided a building block to expand upon throughout the County.

From the Hidalgo County's public Wi-Fi project, providing much needed access to free and secure internet during the COVID-19 Pandemic, to TeamPharr.Net's new City-Wide broadband service, and various locations that are working to secure localized funding and support and address digital equity across areas of need. This localized momentum, along with studies like this one, provide the groundwork and platform for grant applications to the Texas Broadband Development Office, who will be administering NTIA BEAD and DE grants to address the digital divide in Texas.

Public Outreach

Stakeholder engagement was conducted with local communities including city officials, independent school district (ISD) representatives, and more including potential partners for implementation which helped shape the overall understanding of County needs. The project team met with over 32 stakeholders through the course of this study, providing data, insight and feedback which helped shape this report.

Stakeholder engagement allowed us to identify those champions in the community who are active and are ready to support larger, regional initiatives, such as the RGV Broadband Coalition. Additionally, this process allows us to identify a partner, or multiple partners, to implement the preliminary Middle Mile design, incentivizing Last Mile-connectivity to homes and businesses. In addition to stakeholder engagement, a public survey was also launched throughout the County, receiving a total of 1,215 responses.

Results worth noting from the Survey include:

- 25% did not have a home internet connection
    - Due to options not being offered, current options not sufficient, or current options being too expensive
- 58% work remotely
- 29% use it for school/ education purposes
- 13% have engaged in tele-health services
- 26% participate in the Affordable Connectivity Program (ACP)
- 25% pay $51-75 per month and 40% pay $76-100 per month for internet service

Results also included a combined rating chart for various factors ranging from cost and speed to reliability to use the internet. These results are shown in Figure 3

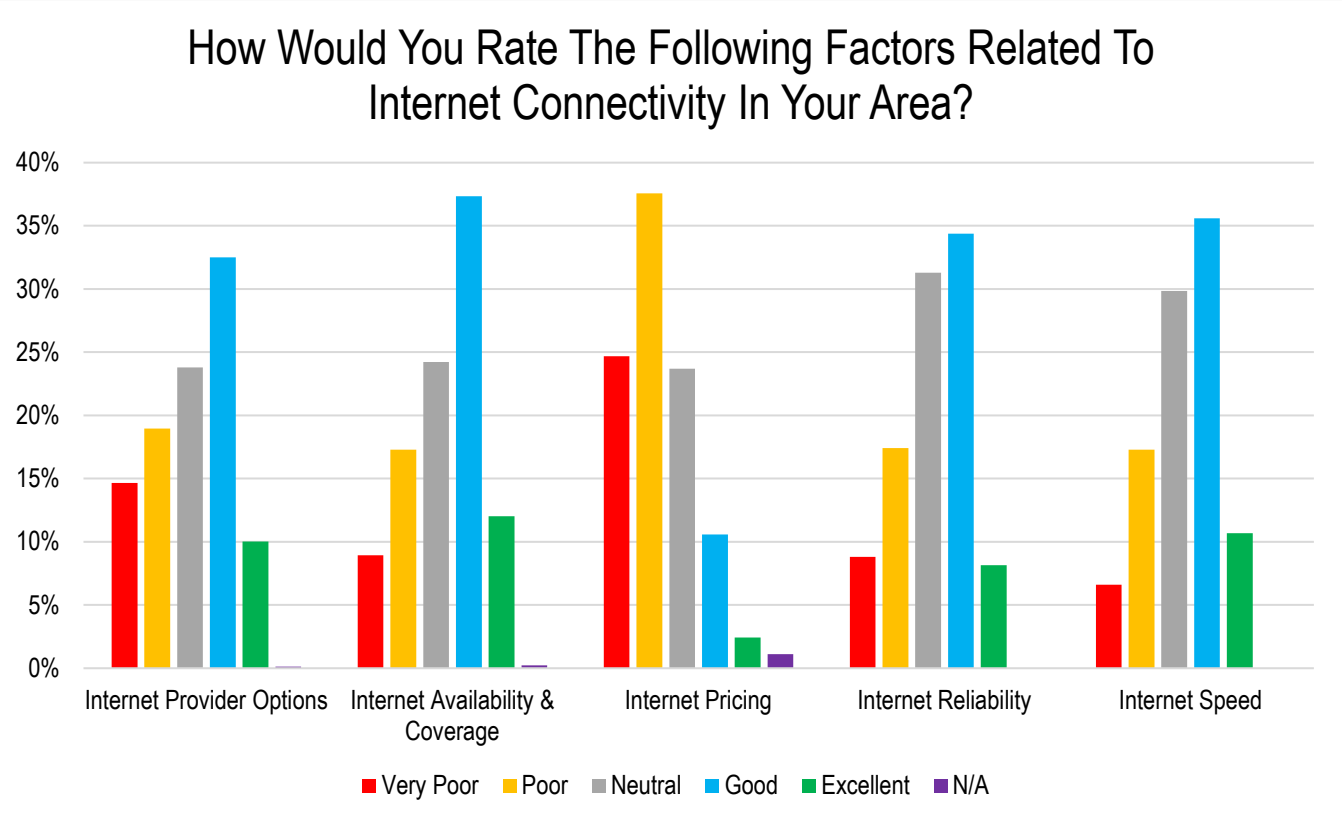

Figure 3: Public Survey Summary

A speed test* was also included with the public outreach survey. Some findings of the Speed Test included:

- Lower speed test results were found in areas where the FCC considers the community as Unserved or Underserved, which may confirm the FCC results.
- The provider that recorded the highest average and median speeds for download and upload with median speeds of 111/12 Mbps, which would still be considered Underserved.

**Speed tests results do not consider peak hours, home network equipment used and access devices used but do provide a sample of what the average user is experiencing.*

Needs and Gaps Analysis

In Hidalgo County, key areas of need related to internet access and adoption are listed below:

Affordable Services: A significant proportion of residents pay over $50 monthly, with almost 40% paying $75 or more, yet the internet speeds often fall short of the 100/20 Mbps threshold, indicating a disparity between cost and service quality.

Smart Device Access: Certain communities have a notable percentage of households (15-25%) without smart devices, and factors like cost, trust in ISPs, and service adequacy contribute to this. The lack of smart devices can lead to further disconnection from modern technologies.

Infrastructure Upgrades in Rural Areas and Colonias: Several regions, Sullivan City, La Joya, Progreso, La Feria, and the Northern part of the County, require significant infrastructure upgrades to meet the needs of the residents. All Colonias share a need for improved internet access, and through stakeholder engagement specific regions have been targeted: Colonias North of Mercedes, a Colonia “row” west of HWY 107 and Conway Rd. in Mission/Alton TX, La Union del Pueblo Entero in San Juan,

ARISE in Alton, the TX A&M Colonias program nutrition center, and the various County Colonia self-help centers.

Digital Literacy: Digital literacy is a complex challenge affected by various factors. While cost and rurality presently impede adoption, it's essential to anticipate that digital literacy might increasingly impede adoption in the future as technology evolves rapidly. Closing the digital literacy gap is vital for bridging the digital divide as technology advances.

Workforce Development: Hidalgo County, home to many higher education institutions and trade schools, produces a large pool of skilled workers and professionals, but is challenged with retaining this workforce as large companies and industries have established their offices near major business, technology, and healthcare hubs. These cities and hubs have robust broadband service offerings which are crucial to companies that rely heavily on internet accessibility, resiliency, and redundancy to keep operations moving.

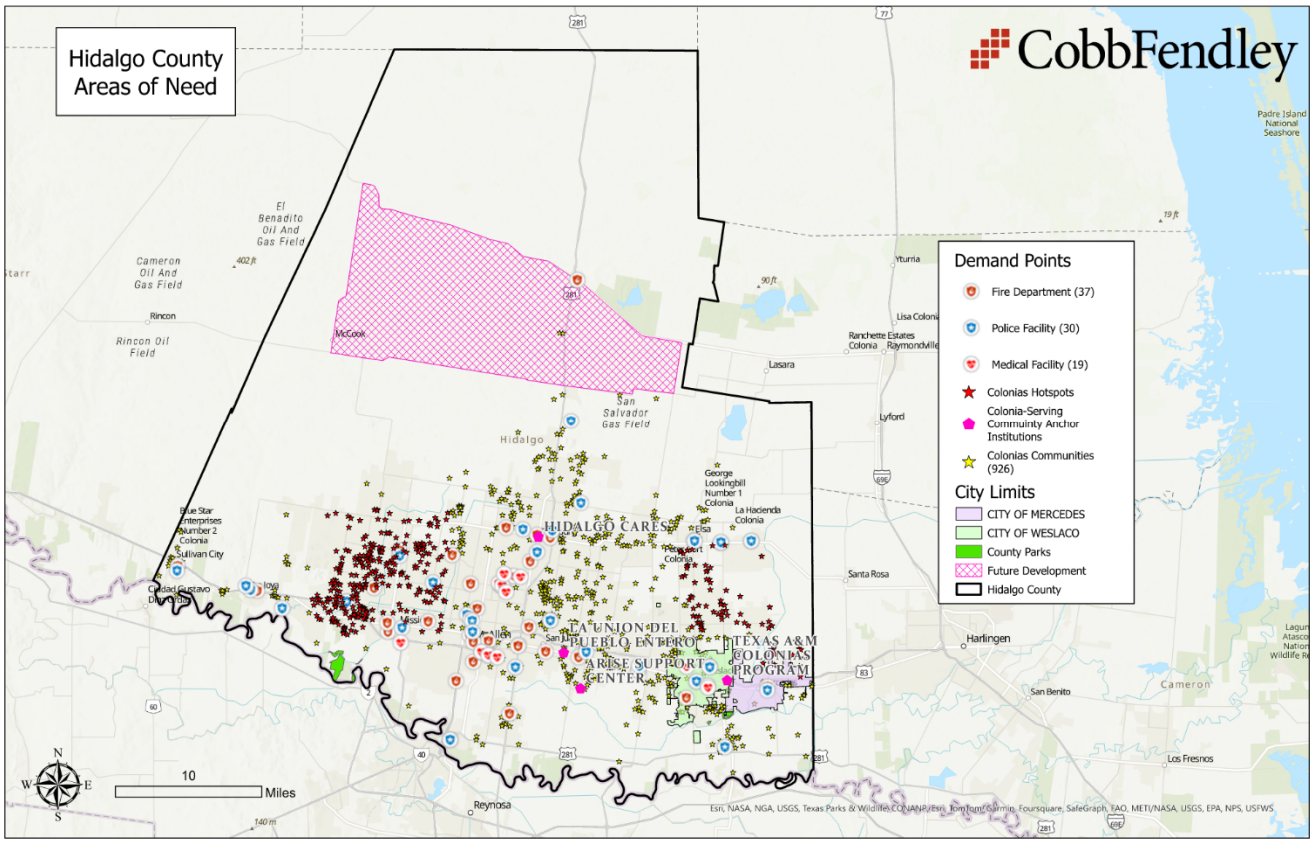

Figure 4: Hidalgo County Areas of Need

Network Design Plan

Considering the data and input from the above sections and phases of the study, our next step was to develop the conceptual design of a Middle Mile network which would provide the basis for infrastructure expansion and internet access throughout the County. The proposed network design footprint seeks to provide Middle Mile infrastructure to provide adequate capacity for Last Mile connectivity. Our analysis shows that the main fiber backbone and distribution, once built or sourced through partnership with owners of existing assets, will allow for network infrastructure to reach the marginalized residents and businesses within the Unserved and Underserved communities, paving the way to incentivize internet service providers with a less costly Last Mile build. The plan emphasizes ring topologies for primary backbone and backhaul routes to ensure redundancy and connect essential communities and existing infrastructure. A quadrant-based network design introduces redundancy through nineteen loops in the County ring topology, catering to present and future population growth.

Our initial design was created under a "greenfield" approach, which does not consider existing service provider infrastructure, and should be reviewed with potential partners to see how each partner can fit into a larger County-wide plan. The greenfield high-level design (HLD) represents the higher end network build magnitude, should incumbent providers and partnerships not contribute to closing the gaps on a regional Middle Mile. This is unlikely and not recommended to pursue as there is a significant footprint of existing broadband infrastructure that overlaps the greenfield Middle Mile, which led us to develop a conceptual Middle Mile HLD that focused on gaps between existing broadband infrastructure and the greenfield design.

Figure 5 represents the other end of the network build magnitude spectrum, assuming all identified existing broadband infrastructure could be leveraged as part of the overall County Middle Mile. Breakdowns for the high-level quantities of base material for both designs are shown in Table 2. As the final design will ultimately be based upon partnership, capacity of existing infrastructure, and funding, our intent is to show the network build range of magnitude and provide industry costing per linear foot (see Table 1) as a metric to understand the low- and high-end costs of building a County-wide Middle Mile.

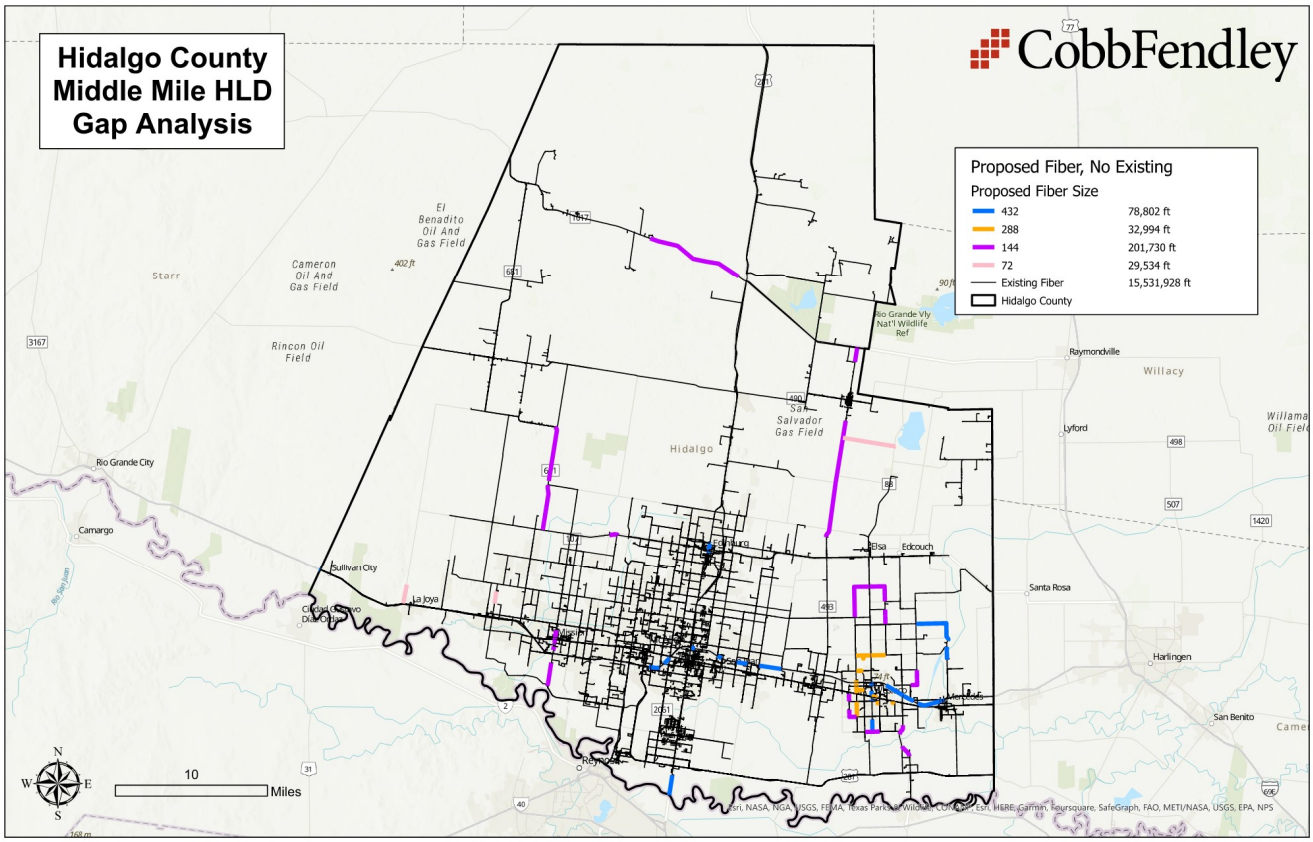

Figure 5: County-Wide Middle Mile High-Level Design Gap Analysis

Table 1: County-Wide Fiber Middle Mile Cost Estimate

Greenfield HLD Cost Values	
Cost Factor	Cost Value
Cost per Linear Foot	$21
Cost per Mile	$109,274

Gap Analysis HLD Cost Values	
Cost Factor	Cost Value
Cost per Linear Foot	$24
Cost per Mile	$127,388

Table 2: Quantities for Greenfield and Gap Analysis HLDs

Greenfield HLD Quantities	
Fiber Size	Linear Footage
432F	641,621
288F	113,997
144F	1,237,275
72F	70,037
12F	21,500
Estimated Slack	26,929
Conduit Size	Linear Footage
2-1.25"	1,421,309
2-2"	641,621

Gap Analysis HLD Quantities	
Fiber Size	Linear Footage
432F	78,802
288F	32,994
144F	201,730
72F	29,534
12F	21,500
Estimated Slack	9,731
Conduit Size	Linear Footage
2-1.25"	264,258
2-2"	78,802

While the immediate focus is on completing the Middle Mile throughout the County, our network design plan includes provisions for Last Mile connectivity, ensuring 12 strands of fiber to converge from outside plant (OSP) operations to inside plant (ISP) for essential demand points. A conservative estimate of 250 linear feet was assumed for this operation. The Last Mile is the final connection to individual homes and businesses, and the design strives to cover FCC-determined unserved and underserved addresses strategically using Passive Optical Networks (PONs). PONs are optimized to cover specific address ranges, ensuring efficient coverage and optimal connectivity for the specified number of addresses, balancing network efficiency and coverage.

PON-based polygons in Figure 6 represent efficient coverage for Last Mile connectivity, focusing on underserved and unserved addresses in Hidalgo County, with adjustments like homerun-based architecture in rural areas for effective coverage.

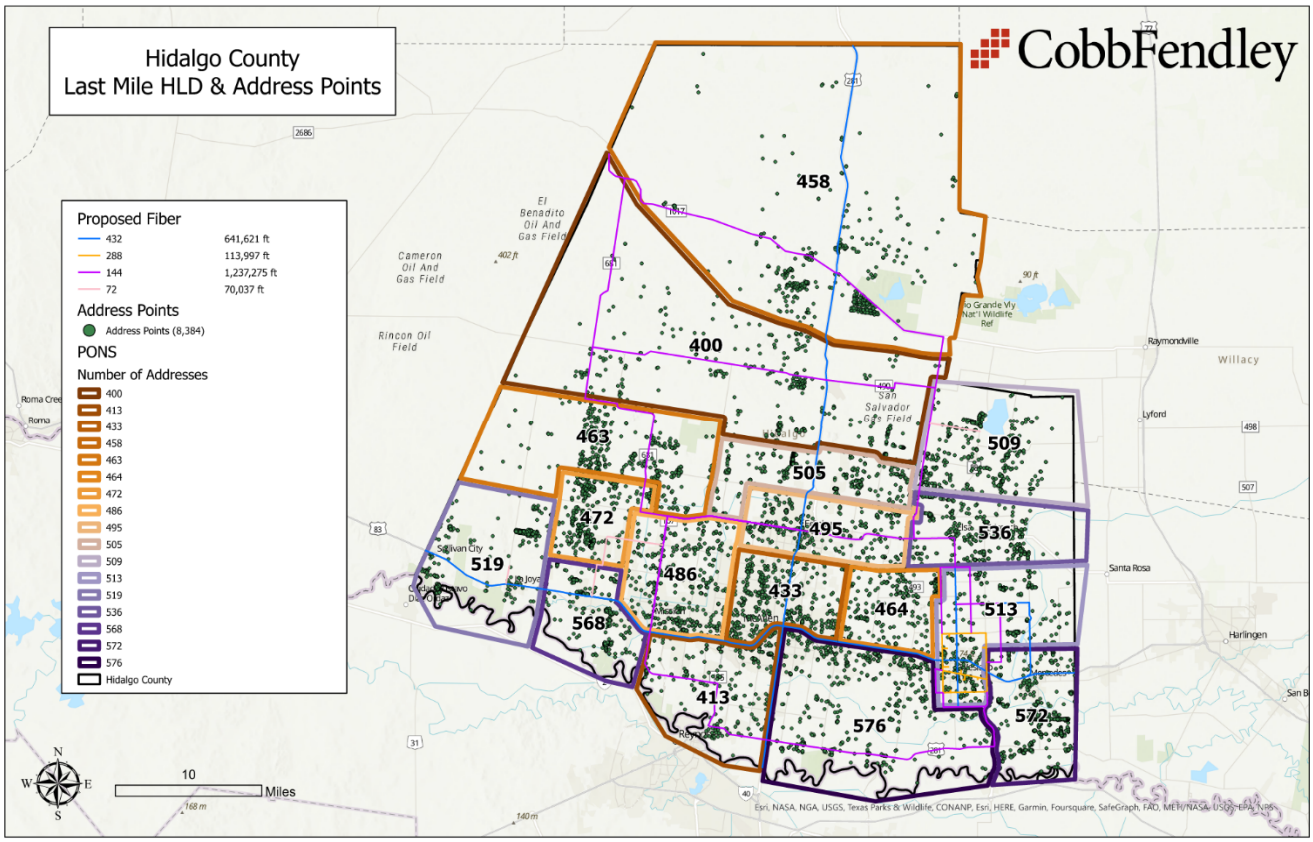

Figure 6: Last Mile HLD & Adress Points

Business Models Options and Funding Analysis

The final two sections of the study and report are heavily dependent on partnerships and subsequent grant funding as a component of the partnerships. As such, we have provided insight, references, and recommendations as to the most practical business models and applicable funding for the county.

Based on conversations with County Officials and various stakeholders, the most likely business model to consider at this time, leading into an RFP Process, is a Passive Infrastructure primary model with an addition of Public Policy, Public Service, Commercial, and Residential accessory models.

In this model, the County's involvement is limited to facilitating some or all of the passive infrastructure needed for the broadband network. Passive infrastructure includes labor and network materials at the physical layer, such as conduit, dark fiber (fiber not being actively used), utility poles, towers, buildings, and properties for Data Centers and POPs. This infrastructure is usually the most costly and is essential to support the network but does not include the necessary transport equipment and connections for access or equipment and provisioning for internet services. A private sector provider or operator would manage the access and service components.

The additions of the accessory models allow a low-risk promotion of broadband expansion through the available policy tools, allows County and local public entity support to address broadband needs for public entity facilities and relative applications, provides commercial services to businesses and commercial properties, and finally provides residential services to underserved communities in need.

Table 3 displays the most applicable federal and state funding opportunities that apply to Hidalgo County. The Infrastructure Investment and Jobs Act (IIJA) has prioritized broadband infrastructure allocating $65 billion in federal funds to be administered across several federal agencies working on broadband deployment. Of the total allocation, $42.5 billion will be administered by the National Telecommunications and Information Administration (NTIA) through the "Broadband Equity, access, and Deployment (BEAD)" program as a part of the "Internet for All" initiative to provide affordable, reliable high-speed internet to every American across the country. This initiative also includes the "State Digital Equity Planning Grant" which will promote digital inclusion. At present, the best chance at receiving federal funding would be through submitting applications for the Digital Equity Capacity Grant Program and the BEAD Program when both are available, with a possibility for the second round of Bringing Online Opportunities to Texas (BOOT) applications.

Table 3: Specific Funding Opportunities

Grant Program	Funding Agency	Description	Timeline	Total Allocation
Bringing Online Opportunity to Texans (BOOT) Program- Capital Projects Fund	U.S. Department of Treasury- American Rescue Plan Act (ARPA)	The program is designed to provide internet service with speeds of 100/ 100 Mbps to households and businesses that are deemed eligible (in eligible areas that have 80% Unserved)	Fall 2024*	$363.8 million, $121million available in 1st round (March 2023) for eligible areas. Next round anticipated in the fall.
Digital Equity Capacity Grant Program	National Telecommunications and Information Administration (NTIA)	States to implement plans and promote digital inclusion; additionally, the program funds an annual grant program for five years.	Fall 2024*	BDO was awarded $3.1 million to develop the State Digital Equity Plan. Plan currently in development in coordination with BEAD plan. Expected allocation is $100 million for Texas.
Broadband Equity, Access, And Deployment (BEAD) Program	National Telecommunications and Information Administration (NTIA)	Through state allocation and planning, this program intends to expand high-speed internet access by funding planning, infrastructure deployment and adoption programs.	2025* (TBA)	$42.5 billion under IIJA. Texas was allocated $3.3 billion. State BDO call for projects in Summer 2024. NTIA approval of State plan anticipated spring 2025
Texas Proposition 8 Creation of Broadband Infrastructure Fund Amendment	State of Texas, administered by the Texas Comptroller	HB 9 would create the Texas Broadband Infrastructure Fund (BIF) administered by the comptroller. Funds in the BIF could only be used for expanding broadband and telecommunications across the state	November 2023* (Ballot)	Anticipated $1.5 billion
USDA ReConnect (Future Rounds)	United States Department of Agriculture	The ReConnect Program offers loans, grants, and loan-grant combinations to facilitate broadband deployment in areas of rural America that currently do not have sufficient access to broadband.	ReConnect Round 5 * (TBA)	

These federal agencies developed standards for determining adequate access to broadband and therefore associated eligibility for funding, typically with "Unserved" areas followed by "Underserved" areas being the primary areas of need. Outside of these residential speed thresholds, community anchor institutions should have speeds of at least 1 Gbps symmetrical (1/ 1 Gbps). CobbFendley's base recommendation for this Broadband Improvement Initiative is a network solution that meets or exceeds a minimum of 100Mbps symmetrical (100/100 Mbps) speed for residential service.

Disclaimer: Funding Opportunities

*The specific dates for the distribution of funding opportunities have not been finalized by the pertinent entities at this time.

The state office for broadband, known as the Texas Broadband Development Office (BDO), will oversee allocating funds as well as providing the best understanding of requirements for grant applications. Official eligibility requirements or application dates are likely to change over time, so it will be best, for all aspects of funding and broadband events, to stay in constant communication with the Texas BDO office during both the RFP process and while heading towards implementation. The Texas BDO will provide awareness of available offerings, promote the Affordable Connectivity Program (ACP), provide knowledge towards broadband education on speeds and technologies, and promote the need of smart devices, which are all additional steps needed to help close the digital divide in Hidalgo County.

In January of 2024, the FCC announced the wind-down of the Affordable Connectivity Program without further funding and Congressional action, this program is projected to run out of funds by April 2024. New enrollments for the program ended on February 7, and wind-down steps are being taken to ensure that households are notified about the end of the program. Program recipients will continue to receive their benefit through April 2024. It is recommended that national and local representatives, organizations, and internet providers look into creating long-term low-cost options to replace the reduced benefits.

Additionally, localized and private funding can fill in gaps and round out investment outside of primary federal and state funding. Eligibility criteria, reporting and administrative red tape may also be a barrier to these primary programs and so partnerships with private financial institutions and non-profit based organizations can be a major asset to the financial viability of many cost components of the initiative.

Partnerships with Banks and Community Development Financial Institutions (CDFIs)

Collaboration with banks and CDFIs under the federal Community Reinvestment Act (CRA) offers multiple financing opportunities. This includes construction financing, permanent financing, New Markets Tax Credits (NMTC), equity investments, and grants. These funding sources align with digital workforce development, digitalization of small businesses, and supporting low-income communities in broadband expansion.

RGV Broadband Coalition Programs

The RGV Broadband Coalition is a collaborative effort addressing broadband accessibility in the Rio Grande Valley. Its programs include regional broadband infrastructure expansion, digital workforce development, civic participation through digital skills, and a small business broadband fund. These programs aim to uplift communities and businesses by providing affordable, high-speed internet and fostering digital literacy.

In conclusion, a wide array of federal and state-level initiatives and funding opportunities are available to boost broadband infrastructure, digital skills, and digital inclusion in Hidalgo County. Collaborative efforts with state agencies, financial institutions, and community organizations are vital in ensuring successful implementation and bridging the digital divide in the region.

1.3 Recommendations

1) **Publish a Request for Proposal (RFP) to identify an Internet Service Provider (ISP) for potential Public-Private Partnerships (PPP):** The County's goals for this project are to connect its current and future marginalized and Underserved residents to high-speed internet and completing that as efficiently as possible. The County recognizes that partnering with an established ISP, or multiple ISPs, is the most effective way to accomplish that goal for its community. The County can collaborate with providers and broadband services partners to determine the optimal network build based on the provided HLD of the County-wide Middle Mile and apply for implementation funding. There are several funding options for implementation that would enable the County to support broadband expansion throughout its community.

There are providers currently operating within the County, with options for additional providers seeking to invest in the near term. An RFP process will enable Hidalgo County to further explore applicable business models and expand on potential PPP contract structure and terms, allowing for a well-informed partner selection and implementation plan. The goals of the RFP would be to:

- Evaluate the potential for developing public/private partnerships with providers and broadband services partners for implementation.
- Evaluate the various applicable broadband solutions presented concerning the study findings and recommendations based on the existing conditions in Hidalgo County with opportunities to discover existing infrastructure or capacities of local providers.
- Understand the financial model structure and overall costs for the project(s) and analyze financial risk and benefits within the partnership.

Evaluation criteria and requirements for potential RFP bidders would include:

- If a respondent is an internet service provider, they must participate in (or are actively applying to) the Affordable Connectivity Program (ACP).
- Provide evidence of past performance and ability to provide a low-cost option for reliable internet service.
- Ability to supply levels of service per NTIA requirements.
- Documentation of existing assets in and around Hidalgo County, preferably concerning updated Fixed Broadband Deployment Data for FCC Form 477.
- Documentation of any funding applied for in the region.

2) **Work with local ISPs to promote existing coverage, future plans, as well as Digital Literacy education**: Not all residential broadband issues are access-related but can also be adoption-related. Many factors such as customer service problems, high prices, or even user capability all lead towards a digital divide which further pushes communities away from an exponentially growing technology. While outcomes from the COVID-19 pandemic forced many individuals and many entities into a need for digital or remote technologies, it may have also created frustration to residents who may not understand the latest requirements in obtaining modern high-speed internet access. High-speed internet requires multiple devices to access it fully, and all of these devices cost money that not all residents have available. Promoting resources such as the ACP or other Federal Communication Commission (FCC) updates can go a long way in bridging the digital divide.

3) **Apply for Competitive Funding Sources for Implementation:** The IIJA provides an unprecedented amount of funding for infrastructure projects that impact our daily lives, including specific funding sources for expanding broadband access across the Country. A review of the various funding sources that can be utilized for broadband infrastructure can be found in the later section titled FUNDING ANALYSIS and key programs are listed in both Table 3 and Table 17. A major program to focus on is the state-led Digital Equity Program. This funding will flow through the state to ensure communities have the skills, technology, and capacity needed to reap the full benefits of our digital economy.

The Affordable Connectivity Program should also be promoted and utilized throughout the community where barriers to adoption are due to financial constraints. While the level of eligibility based on the current maps is an impediment to securing adequate funding, the County in partnership with the selected ISP through the RFP can evaluate the various funding mechanisms that can be utilized to drive implementation and provide reliable, affordable internet to the residents of Hidalgo County.

2 CURRENT STATE OF BROADBAND IN HIDALGO COUNTY, TX

Hidalgo County exhibits a distinctive pattern of population concentration, with most of its cities and population centers situated in the southern-central region of the County, while the surrounding areas predominantly maintain a rural character. The extent of modern broadband infrastructure mirrors that densification within Hidalgo County, but the various types of services offered are still uniquely determined by the regionality of a home or business address. The more populous areas of the County include the cities of McAllen, Edinburg, Mission, and Pharr, just to name a few. However, outside of these cities and where the communities become more rural, generally, there is expected to be less technological infrastructure due to fewer people residing there, and parts of Hidalgo County are no exception to this. Residents within McAllen, for example, may have multiple options for internet of all technology types including fiber, cable, or fixed-wireless, all at various pricing levels, but Colonia residents outside of greater city limit boundaries may only have limited access to a singular wireless option. In the sections below, internet service options, broadband infrastructure, homes served, and potential barriers will all be explored to help determine what the current state of broadband is across Hidalgo County.

Notes:

- When discussing internet speeds, the written form may occasionally be seen in the format of "Y/Z" or "YxZ" where Y is the download speed (typically with units of Mbps), and where Z is the upload speed (also typically with units of Mbps).

- The term "Unserved" represents an area that does not currently have any one internet offering at the 25/ 3 Mbps speed threshold. The term "Underserved" represents an area that does not currently have any one internet offering at the higher 100/20 Mbps threshold, which has been determined through various funding sources, such as the National Telecommunications and Information Administration (NTIA).

2.1 A Brief Background on Current Internet Standards

At present, the official definition of broadband by the Federal Communications Commission (FCC) is internet speeds of 25Mbps download and 3Mbps upload. This was formally established by the FCC in 2015 during the latest update of the broadband definition, which had been set at 4/1 Mbps in 2010. It is important to note that even speeds of 25/3 are not necessarily sufficient to meet the growing needs of the populace, especially among students or remote working professionals. The minimum speeds for broadband set by the FCC were based on perceived sufficient internet usage in 2015 and focused on internet browsing, email, and limited streaming media (i.e., primarily download-focused). Videoconferencing and other common applications in recent years demand high bandwidth in the upload direction as well.

For example, in a typical household, if multiple residents are working from home or attending classes via Zoom, and another is using their broadband connections to attend occasional meetings, send e-mails, and do research, their combined required bandwidth could easily exceed this FCC minimum level of broadband service. Bandwidth needs are constantly increasing, so even supposed "sufficient" speeds by today's standards will be inadequate soon based on network technology trends and emerging smart applications. Many industry experts would like to update the FCC definition and minimum standard of broadband to 100 Mbps symmetrical (100 Mbps download/100 Mbps upload), which was used as a benchmark in this study when evaluating current service offerings as it relates to a sustainable broadband solution.

Disclaimer: FCC Data Fluctuation

The following figures and tables shown throughout this report illustrate the available internet services offered in Hidalgo County based on information gathered from the FCC. The FCC has undertaken a massive overhaul of the data collected from internet service providers (ISPs) and the way in which that is now publicly displayed. Through the FCC's Form 477, the previous method of understanding coverage was at the spatial level of census blocks. This means that if any one home address was served with a higher speed for internet or a more modern connection, such as fiber compared to DSL, for example, then the entire census block was shown as covered for that higher standard.

However, in late 2022, the FCC modified its process to show proper internet representation at the address level. This now ensures that the user can be aware of what is present at an address at any given time, but it also shows the extent to which specific ISP coverage exists in each market. As the FCC continues this new process, the data that has been made public thus far is still being updated and reviewed.

The information contained in this report from the FCC is subject to constant change and potential discrepancies due to the dynamic nature of data reporting. While efforts have been made to ensure accuracy, variations can arise from changes in reporting methods, updates to services, and network infrastructure fluctuations. Readers should interpret this data as a general overview rather than an absolute representation, and exercise discretion while considering the potential for inconsistencies stemming from reporting practices. The project team recognizes the challenges in accurately capturing the ever-changing landscape of broadband services.

The most recent data made public by the FCC was collected from ISPs in December 2022 and published in August 2023. That is the data used within this study, where applicable.

2.2 Internet Service in Hidalgo County

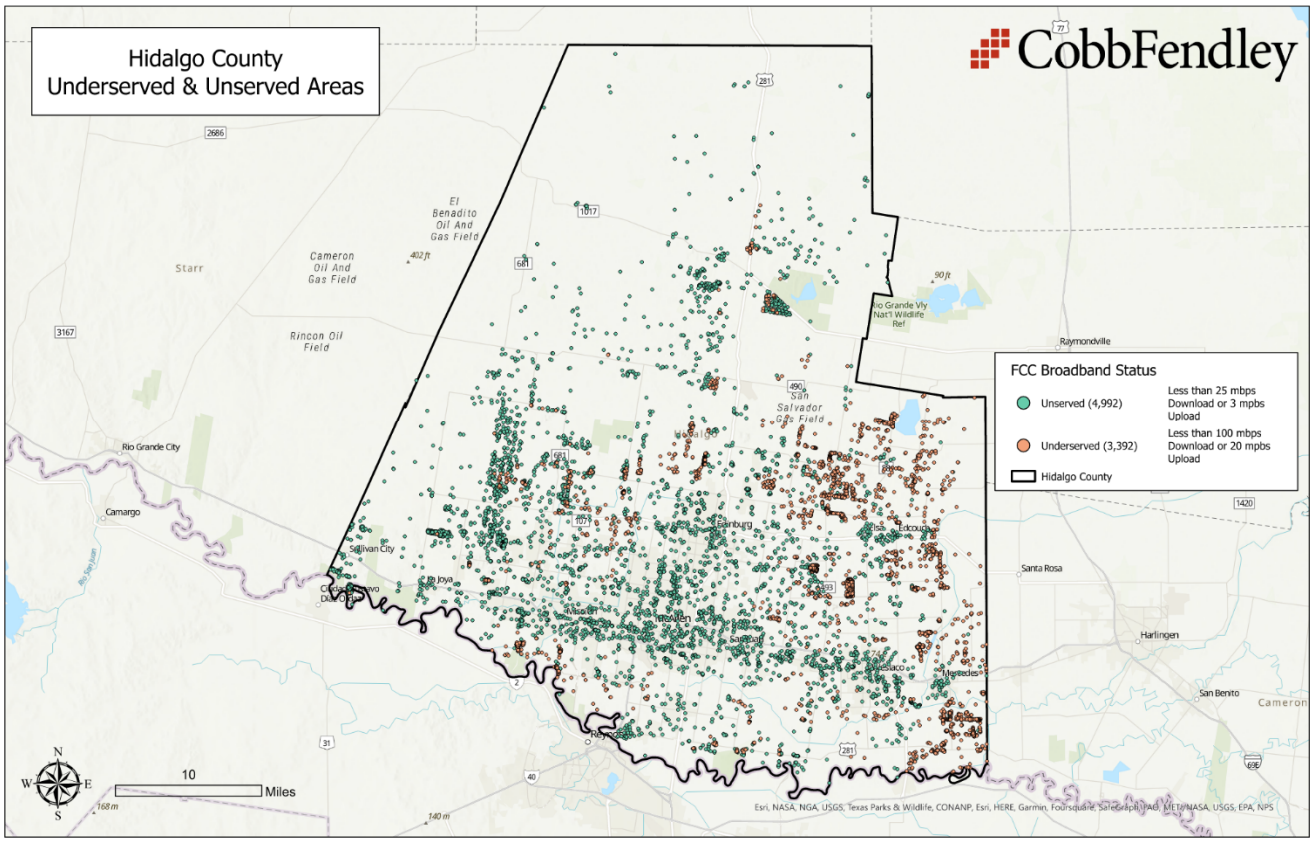

Figure 7: Unserved and Underserved Areas in Hidalgo County

In Figure 7, Hidalgo County is recorded as having Underserved areas with a total of 3,392 addresses and an additional 4,992 addresses that are Unserved. These addresses are spread evenly throughout the County and are not limited to any one area or community. As shown in later figures, many of these addresses classified as Unserved or Underserved are in communities where ISPs say they have infrastructure or provide high-speed internet service.

For reference, the FCC data provides a combined 263,961 total address points within Hidalgo County. This includes both residential and business address locations. This means that about 1.3% of all total addresses within Hidalgo County do not currently have access to high-speed internet with speeds of at least 100/20 Mbps, and an additional 1.9% of addresses do not currently have access to the minimum FCC internet of at least 25/3 Mbps. The absence of high-speed internet alternatives affects all sections of the County, both within and outside of city limit boundaries.

It should be noted that from previous FCC data sets of April 2023 and June of 2023 (where, as a reminder, the data in this figure is from August 2023), the Underserved and Unserved addresses have much higher numbers and have been drastically reduced by tens of thousands. This may suggest an expansion of infrastructure and service or simply updates at the FCC level, but so as not to make any assumptions, the most recent data source will be used for this study.

Various technological internet infrastructure options, such as fiber optic cable, co-axial cable, fixed-wireless, etc., provide different values of maximum speed offerings for resident and business users. A breakdown of various primary technology options for internet will be explored next, as well as identifying the more dominant residential internet providers in Hidalgo County.

Table 4: Top 10 Providers in Hidalgo County, TX

Hidalgo County, TX Top Residential Providers			
Internet Name	**Provider Name**	**Percent of Units Covered**	**Technology Services Offered**
HughesNet	Hughes Network Systems, LLC	100.00%	GSO Satellite
Viasat	Viasat, Inc.	100.00%	GSO Satellite
Starlink	Space Exploration Technology Corp.	100.00%	NGSO Satellite
Spectrum	Charter Communications	89.29%	Fiber to the Premises, Cable
VTX	Valley Telephone Cooperative, Inc	77.09%	Copper, Fiber to the Premises, Unlicensed Fixed-Wireless, Licensed Fixed Wireless
T-Mobile Home Internet	T-Mobile USA, Inc.	65.88%	Licensed Fixed Wireless
Innercity Fibernet	Innercity Fibernet LLC	34.86%	Licensed Fixed Wireless
AT&T	AT&T Inc.	31.21%	Copper, Fiber to the Premises, Licensed Fixed Wireless
Verizon Home Internet	Verizon Communications Inc.	26.89%	Copper, Fiber to the Premises, Licensed Fixed Wireless
SmartCom Fiber	SmartCom Telephone, LLC	5.98%	Fiber to the Premises
Source: FCC National Broadband Map			
Type: Residential, Technology: Any Technology, Speed: 25/3 Mbps or greater			
Data As Of Dec 31, 2022 (Last Updated: 7/25/23)			
https://broadbandmap.fcc.gov/area-summary/fixed?version=dec2022&geoid=48215&type=county&zoom=9.35&vlon=-98.224199&vlat=26.410314&br=r&speed=25_3&tech=1_2_3_4_5_6_7_8			

Table 4 identifies the primary ISPs that are present within the County. Most of these providers offer some sort of wireless connection, either through satellite or fixed-wireless. Both technology types have grown exponentially in terms of quality of service offered within recent years, especially fixed-wireless. Typical fixed-wireless solutions to the home operate using point-to-point signal transmission through several types of waves from a localized radio at a high vertical location that then connects to a set-up at the user's address. The towers that supply the wireless signal are typically fed by fiber-optic cable before converting into a wireless spectrum to then reach the end user. However, some of the fixed-wireless services offered within Hidalgo County are from wireless network operators which turn their 2G, 4G LTE, or 5G data into home internet that max out at just under 200/ 30 Mbps speeds for the end user on T-Mobile and 1000/ 50 for Verizon, under perfect conditions with optimal infrastructure in place. These services are offered at a range of about $30 to $70 per month, depending on whether you are also a cellular customer for that same provider or ISP.

Satellite options, such as Starlink, HughesNet, and Viasat are internet options that use an antenna at the end user to connect with a satellite to offer an internet network. These satellite options are typically best suited for rural residents or users away from urbanized areas where connectivity is typically a challenge to receive, if at all. However, due to the nature of the long range between the end user and the satellite, the quality of the network connection is typically poor and perfect conditions are difficult to achieve as situations like inclement weather can have a major impact on the user's connectivity. Additionally, the pricing for these options is typically high, compared to the advertised speeds. Prices start anywhere from $50 to $100 a month, but additionally for an option like Starlink a $599 entry fee is required to get the necessary equipment. While this may be the only option rural-based residents may have, it also may not be able to be afforded in all communities.

All the wireless based options shown available in the County are not exclusive to Hidalgo County. Due to the nature of their infrastructure and coverage, these internet options are offered across the entire country. These solutions are beneficial to many of the communities that are present in Hidalgo County due to their rurality. Typically, ISPs may not choose to offer certain communities with wireline-based internet options due to the population density and the cost to build out. In these situations, the ISPs would then ultimately lose money and it would not make business sense. This is where the wireless-based options make sense, in terms of business and implementation. Other factors that may impact wireline versus wireless solutions could be due to geographical barriers such as water bodies, pipelines, or other geographic barriers that occur in which Hidalgo County.

Fixed wireless internet presents a compelling option that offers efficiency, adaptability, and agility. While it is an option in scenarios where immediate deployment, remote accessibility, and scalable expansion are crucial, it's imperative to acknowledge its susceptibility to interference and potential limitations in bandwidth and speeds. The choice between fixed wireless and fiber internet hinges on the interplay of geographical context, budget, speed requirements, and the technological circumstances of the area in question.

Outside of these wireless solutions, the wired residential options for the County include AT&T, Spectrum (Charter), Valley Telephone Cooperative, Inc (VTX), and SmartCom. Additionally, each of these wireline solutions are implemented through different materials such as copper, cable, and fiber. All ISPs listed reportedly offer fiber to the premises (FTTP) in the County, but in addition to fiber-based options, Spectrum offers Cable, VTX offers copper and fixed-wireless options, and AT&T also offers copper.

The future of broadband is through the convergence of multiple network types and platforms but, at the core, modernization requires a strong fiber backbone and wireless infrastructure that can deliver heavy bandwidth services. Fiber is a technology that can scale upwards as capacity needs expansion and can also achieve symmetrical speeds, in which the download and upload speeds are identical. With futureproofing of the network in mind, it is important to recognize that existing communication technologies are limited to meeting the increasing capacity demands.

An article by Brookings raised the concern that funding efforts to bridge the digital divide cannot be limited to the minimum 25/3 broadband standard and goes further into why the proposed symmetrical standard will change the way existing broadband infrastructure needs to be looked at. Tom Wheeler, Governance Studies, Center for Technology Innovation, was quoted, "By stipulating the deliverable must be 100 Mbps symmetrical, the legislation leaves the door open should other technology come along. But the reality today is that only fiber can provide high-speed 100 Mbps in both directions".[3].

While fiber may be the best technology offered in a vacuum, it is not always feasible to implement. In the locations that do offer modern broadband solutions, many of the plans could be unaffordable for these communities (as shown in later figures). Ideally, ISPs with more advanced network architectures will fill in the gaps of the current services offered to help serve more of the disproportionately impacted communities at affordable pricing.

[3] Wheeler T. Don't replace the digital divide with the "not good enough divide". Brookings. https://www.brookings.edu/blog/techtank/2021/06/21/dont-replace-the-digital-divide-with-the-not-good-enough-divide/. Published 2022. Accessed June 1, 2022.

2.3 Broadband Infrastructure in Hidalgo County

In Figure 8 and Figure 9, a tool known as Fiberlocator is used to identify existing fiber for both Long Haul Networks and Metro Networks. Fiberlocator is a web-based platform that helps the user understand what fiber-based assets are available throughout the United States. It does not show every line of fiber that exists, but only what is allowed to be shared by the ISPs or infrastructure owners.

Dark fiber is a term that refers to existing unused or unlit optical fiber cables laid underground or along infrastructure routes. Unlike "lit" fiber cables that carry data signals, dark fiber is inactive and without data traffic. Organizations often lease or buy dark fiber to create their own high-speed private networks, gaining full control over data transmission and bandwidth. Part of Fiberlocator's usage is for other network providers to know what dark fiber is currently available to potentially lease or buy for their own projects, therefore this information does not show everything present, especially since network maps are typically proprietary information. It does, however, offer the best option to knowing a fraction of what fiber assets are presently available, and can be used as a starting point to understand infrastructure in different communities.

While fiber network lines within a long-haul network may not be responsible for directly providing fiber to the home from the ISP, it does help highlight where essential infrastructure is currently located within Hidalgo County. These network fiber lines are required to carry more information compared to a local area network (LAN) and span larger distances that include city to city across the state or country. As seen in Figure 8, the long-haul network infrastructure runs primarily east and west along highways 83 and 2, with additional routes through the Mexican American border in the City of Hidalgo.

The carriers here include Arelion, AT&T, Fiberlight, Level 3 (formerly CenturyLink, and presently Lumen Technologies), Sprint, and Windstream. It should be noted that Arelion and Lumen do not directly provide residential internet with their infrastructure and are more enterprise and Tier 1 focused. Fiberlight is more of a Middle Mile, dark fiber provider, in addition to their enterprise services, but will have the capabilities to partner with Last Mile providers to offer residential services. In Figure 8, all these providers are located within the same route through southern Texas except for the routing to the Mexican border. In review of Figure 9, the business-related metro network helps formulate a better understanding of the fiber distribution infrastructure conditions by examining what enterprise related fiber is available compared to what may just be passing through the area with a long haul network. Unlike long haul networks, these metro networks use infrastructure within the area of a city or metropolitan area, which also allows these networks to be referred to as a Metropolitan Area Network (MAN).

The carriers serving metro networks within the County, as seen in the figure, include Arelion, Crown Castle, ExteNet Systems, Fiberlight, Hudson Fiber, LOGIX, MetroNet, SmartCom, Uniti Fiber, VTX, WANRack, and Windstream. Based on the previously reviewed Table 4, using this new source of information it can be seen where both residential and business-related fiber in the County is coming from. With this larger list of metro-based carriers, the expanse of coverage is more diversified with options for small cell and 5G, to Tier 1 enterprise, to dark fiber, and more.

The Texas Lone Star Network (TSLN) is a consortium of several rural telecommunication and fiber carriers throughout the state, many of which are located within these metro network routes. These routes run through Harlingen from the north until Military Highway 281 where it then turns west to mostly run along the border throughout the Valley. Outside of these converged TSLN routes, the most expansive metro networks within Hidalgo County include Fiberlight, SmartCom, VTX, with ExteNet/ Hudson providing additional service primarily within McAllen.

Comparing this reviewed information with that of Figure 10, which is derived from FCC data showing where all fiber internet is offered to any address, fiber offerings are spread throughout the County. Offerings are located within all the major cities along Highway 2, such as McAllen, Pharr, San Juan, Mission, but also even going north into the greater Edinburg area. The extent of the fiber services offered throughout the County are located along many of these metro routes and are likely offering options even outside of city limits. While this figure does not differentiate residential and business fiber offerings, it does show that fiber infrastructure is present and abundant within the County. While additional details will be provided later in the report, this suggests that perhaps access is not the primary issue for residents within Hidalgo County, but instead it

is adoption.

In addition to fiber, Figure 11 and Figure 12 highlight the infrastructure for both cable and copper (or DSL) services that are spatially located, respectively. The cable services, which still can provide adequate future-proof offerings, to cover more outside of these metro areas compared to fiber. While it does expand outwards of the city limits within the greater western-central region of the County, it does not expand further north the way the fiber offerings do. For copper technologies, which is not a recommended material for future-proof solutions, they are mostly located primarily within the city limits of the major cities in Hidalgo County. Outside of this in the more rural areas of the County, the options for copper are mostly sparse. Many providers tend to remove copper infrastructure and replace it with fiber or cable, and this is something that may be occurring in Hidalgo County. For residents outside of this greater southern-central region of the County, many may only be able to turn to satellite-based internet for their needs. Additionally, based on this most recent update of FCC data, there are now fewer addresses offering these technologies compared to fiber.

Finally, fixed wireless options can be seen in Figure 13. This solution provides the most coverage across the County with more than 450,000 addresses served. Fixed wireless solutions in Hidalgo County may be the only option for some residents, especially those north of FM490, as fixed wireless is particularly beneficial in rural or remote areas where laying fiber cables might be economically and logistically challenging. Wireless signals can be transmitted over long distances without the need for extensive infrastructure, making it a viable option for areas where traditional wired solutions are not feasible. In Hidalgo County, fixed wireless solutions offer the most availability from ISPs.

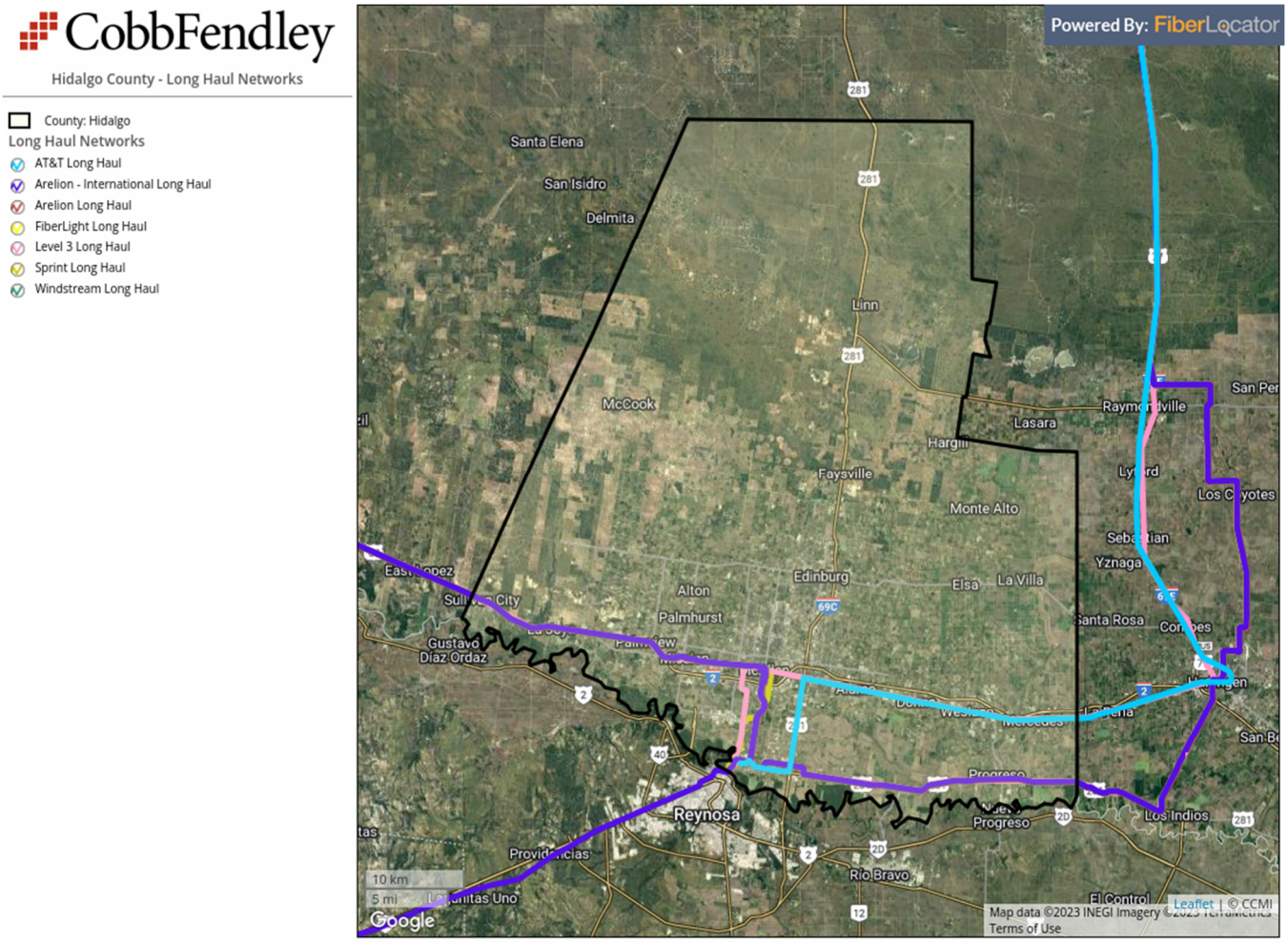

Figure 8: Long Haul Networks Within Hidalgo County

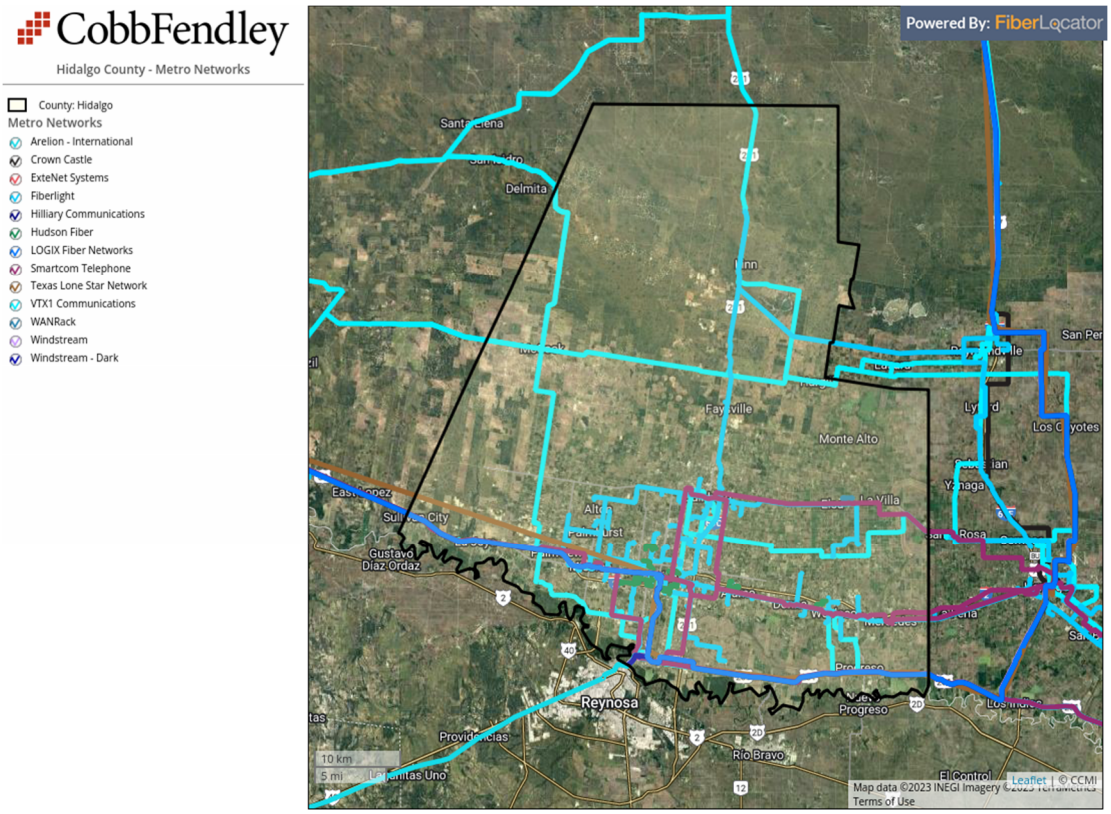

Figure 9: Metro Networks Within Hidalgo County

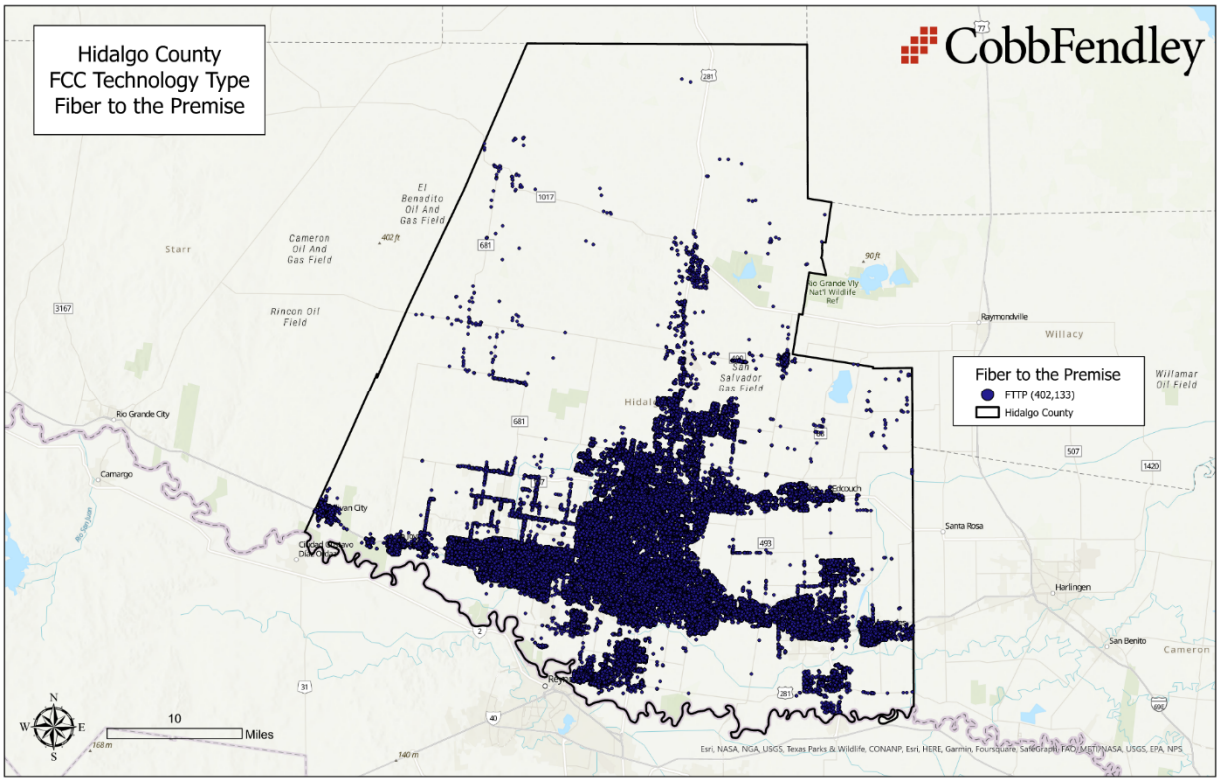

Figure 10: Fiber Service Areas in Hidalgo County

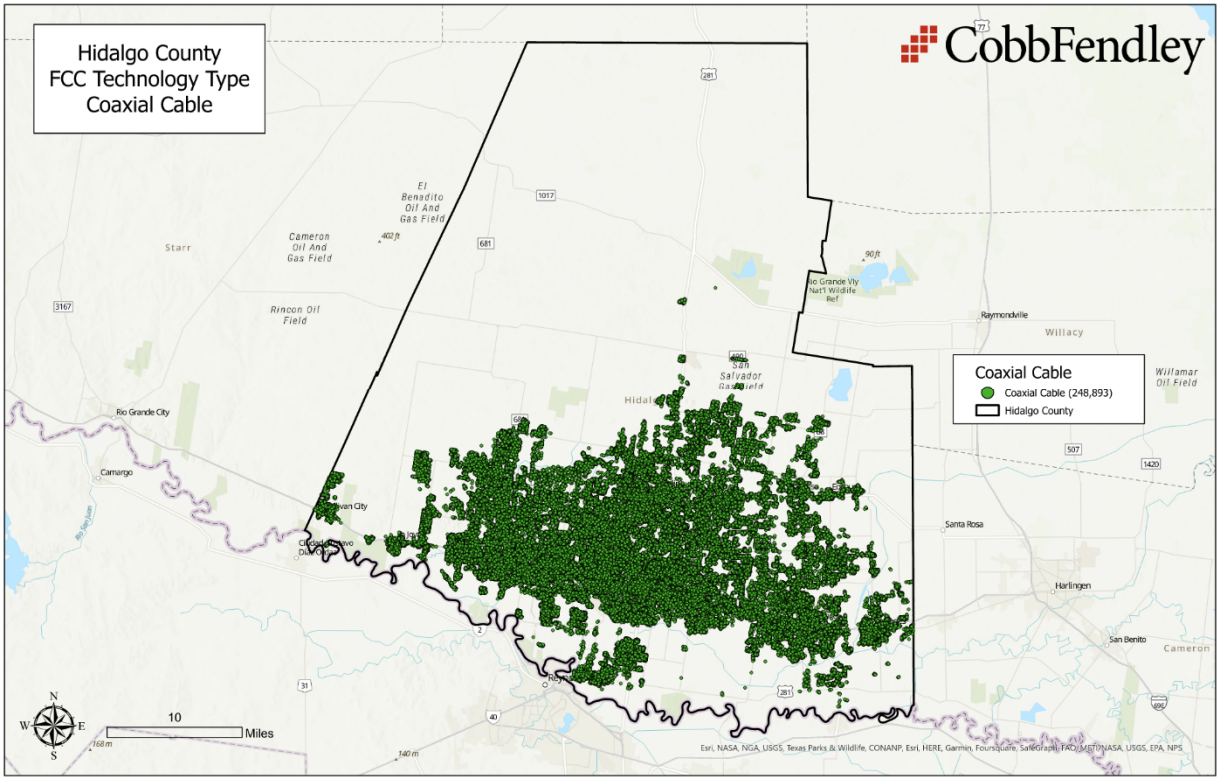

Figure 11: Coaxial Cable Service Areas in Hidalgo County

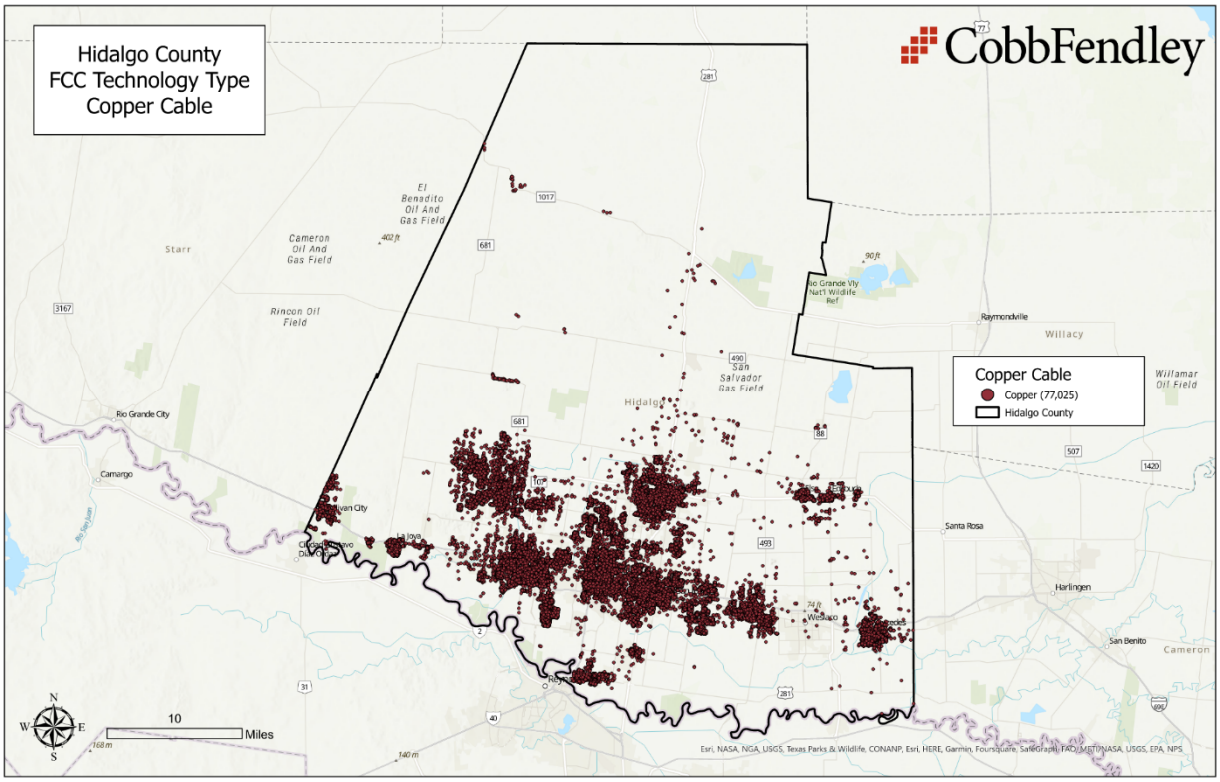

Figure 12: Copper Service Areas in Hidalgo County

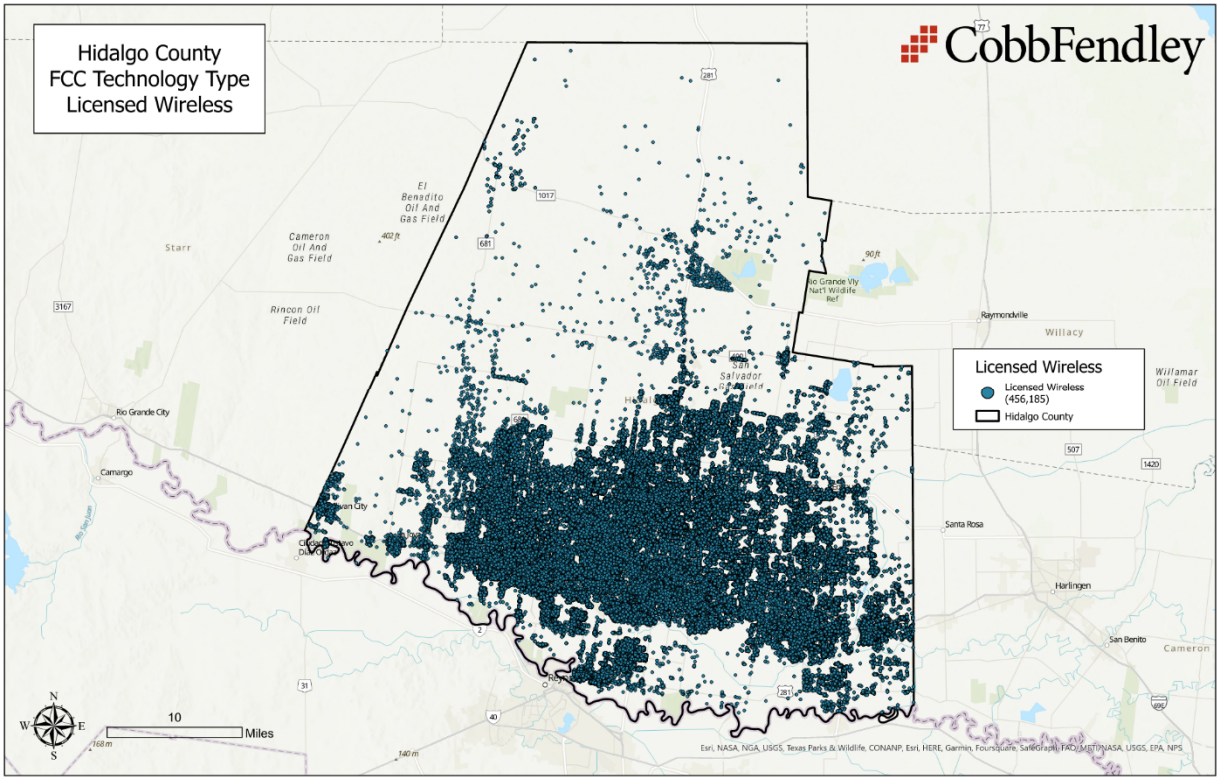

Figure 13: Licensed Wireless Service Areas in Hidalgo County

2.3.1 An Additional Note on Pharr, TX

After the City of Pharr was recognized as the least connected city within the entire country, city leaders decided to invest and address the need for broadband infrastructure. To help close the digital divide, the city created their own city-based internet option for residents and businesses, which is rare in the United States, called TeamPharr.net. This internet option, at the residential level, offers either a $25 per month plan for 500 Mbps symmetrical speeds (500 Mbps speeds in both the download and upload direction) or a $50 per month option for 1 GB symmetrical speeds, with options to include the ACP for even further discounted options.

To help create this option for the City of Pharr, approximately 2 million linear feet of fiber was designed and installed which has allowed about 21,000 total residents with a future-proof solution. Additionally, 217 permits were designed and approved for various jurisdictions, 37 of which were inside plant (ISP) designs that were created to provide service to various buildings, and 182 were outside plant (OSP) designs that included backbone fiber, subdivisions, and private communities.

Overall, the City of Pharr has completely transformed their city to be a source of reliable, affordable, and high-speed internet options for residents and businesses. While this is currently located primarily within the City of Pharr's limits, plans to expand may come upon completion of the city-wide build out of the network.

It should be noted that the latest FCC data does not include TeamPharr.net internet as an ISP option.

2.3.2 Insight's Case Study for Implementation of Public Wi-Fi in Hidalgo County

Hidalgo County faced the challenge of bridging the digital divide exacerbated by the COVID-19 pandemic, particularly for its rural population lacking adequate internet access. With a tight deadline set by the original CARES Act Funds spending cutoff of December 31, 2020, the County expedited its Wi-Fi project by utilizing an existing contract from a company called Insight and a multivendor network that included Cisco, Palo Alto Networks, and Ruckus wireless mesh.

Collaborating with SmartWAVE, Insight's Cloud+ Data Center Transformation (CDCT) team designed and deployed a comprehensive free public Wi-Fi network across the County, utilizing existing infrastructure like water tanks and poles. The network, tailored for more than 30,000 students and teleworkers, offers secure and compliant internet access while aiding remote work and distance education. This initiative helped address pressing challenges and promoted equitable access to digital resources in the County's less privileged areas.

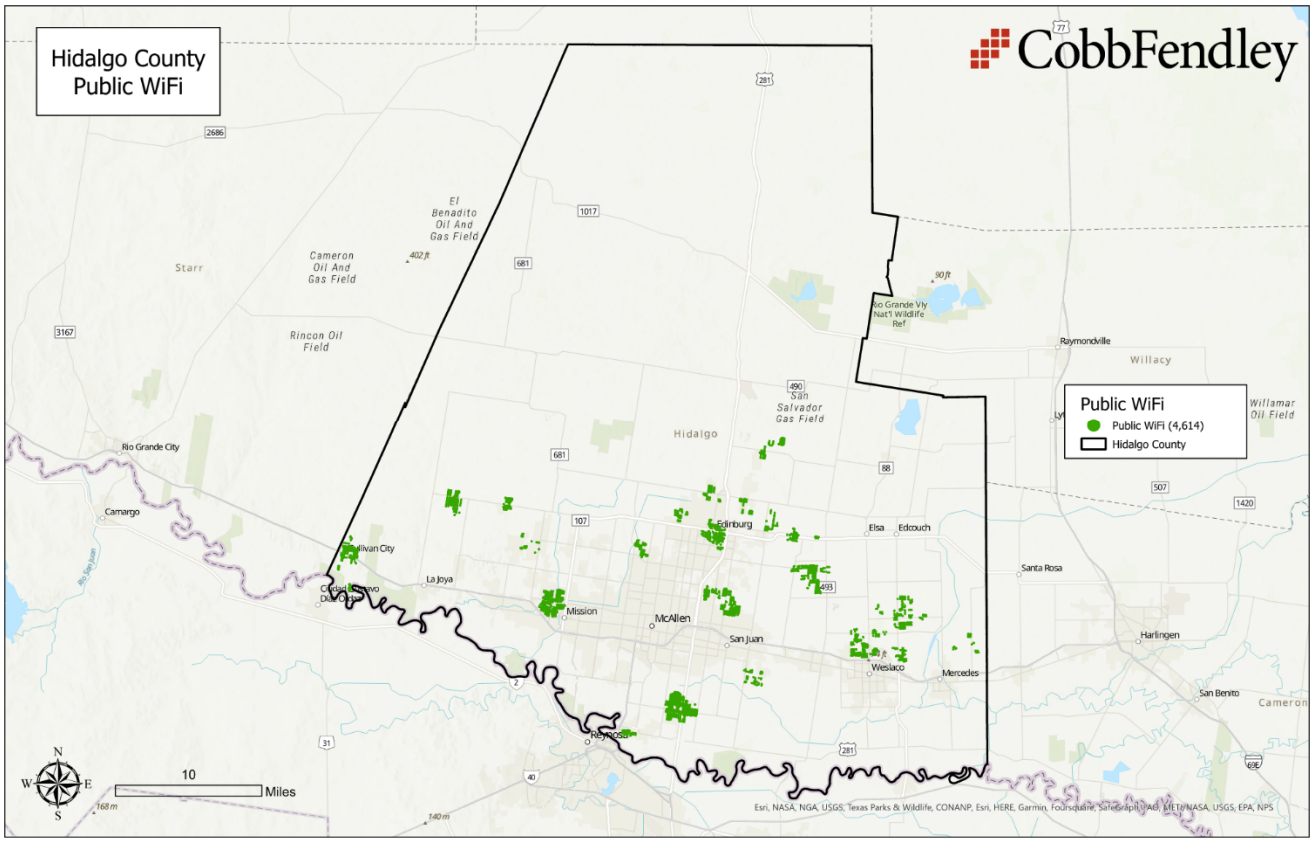

Figure 14: Hidalgo County Public Wi-Fi Project

2.4 Potential Barriers to Additional Infrastructure

The final factors that go into network implementation are environmental externalities, constructability, and sustainability. These factors are usually an afterthought in network engineering, but they are essential as they challenge the network build with real concerns and constraints, whereas design can be completed in a vacuum. External environmental factors include regulatory and jurisdictional constraints, industry trends and competition, and socio-political conditions. These factors have the potential to disrupt the network build and should be anticipated and contingencies should be formulated to control risk.

Regulatory and jurisdictional entities introduce constraints such as the engineering design and construction requirements of the OSP, and these constraints may further impact the build in the permitting process. While this is a necessary process, the timeline and fees involved should be considered as they impact on the budget and schedule of the build. Design engineering firms will need to have the knowledge and experience of working with these entities to ensure that the permitting schedule does not delay and fragment the construction efforts. Physical and geographic barriers are often overlooked as having an impact on broadband services, but they can be a valid deterrent to utility construction as the natural and manmade features can be costly to build across and significantly delay the project in permitting.

In Figure 15**,** pipelines, railroads, and entities within Hidalgo County are depicted. Based on the figure, railroads primarily run east to west, and mostly parallel to highways 2 and 107. While they do pass through nearly all the major cities in the County, railroads do not appear to prevent any major infrastructure from being permitted.

The leading potential issue regarding permitting and implementation would be regarding the many cities a route would likely pass through while going from east to west through Hidalgo County. Ideally, utilizing TXDOT ROW for an underground network would contain the least amount of city permitting processes to prepare for but it may not be feasible for all high-level routes. If possible, TxDOT-based routing options would be the best option in preventing delays throughout the County.

Another potential barrier throughout the County would be installing a network in areas dense with pipelines. The locations throughout the County that appear to contain the most pipeline infrastructure includes:

- Along FM490, near McCook in western Hidalgo County
- Along FM1017, near intersection of FM681 in western Hidalgo County
- Along FM907, south of Alamo near the Mexican border

While this is where the pipelines appear to be more densely located, pipeline infrastructure is abundant throughout the County. An easy solution to avoid pipelines would be to run network infrastructure aerially where possible.

Finally, other jurisdictional entities to be mindful of are water authorities, irrigation districts, drainage districts, and the International Boundary and Water Commission as there are ample water bodies located in Hidalgo County. Many of these water bodies to be mindful of include La Joya Creek, Hackney Lake, Lake Conception, Sardinas Resaca, McAllen Main Canal, Edinburg North Main Canal, and Edinburg East Main Canal, to name a few. Crossing bodies of water of any size would likely increase permitting times.

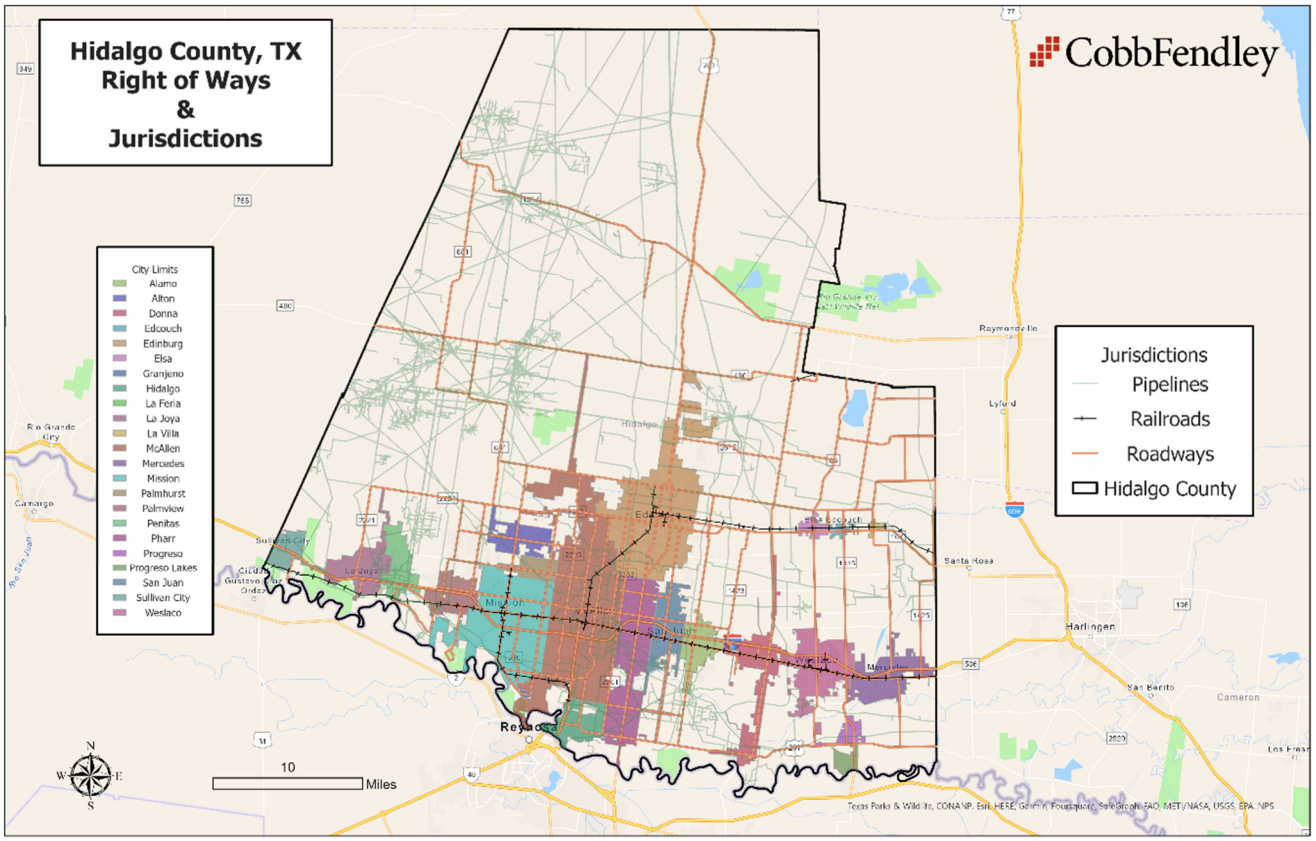

Figure 15: Right of Ways & Jurisdictions in Hidalgo County

2.5 Geographic Reach and IIJA Covered Populations[4]

2.5.1 Persistent Poverty

The Rio Grande Valley (RGV) is a mix of urban and rural and part of a federally recognized persistent poverty region, the Texas-Mexico Border, meaning over the last three decades at least 20 percent of the population has lived below the poverty line. According to the latest U.S. Census QuickFacts (2022), the following are the percentages of population living in poverty in the four RGV counties:

- Hidalgo County has 23.9%
- Starr County has 25.2%
- Willacy County has 34.3%
- Cameron County has 24.4%

The other persistent poverty regions in the country include Central Appalachia, the Mississippi Delta, the southern Black Belt, and Tribal Lands. In the IIJA, Congress instructed the NTIA to target these underserved areas of the country for broadband investment.

2.5.2 The Texas Border Colonias

Within the border region are Colonias, which are economically disadvantaged communities that are rural, or "rural in nature," and lack safe housing and basic infrastructure, such as safe drinking water, wastewater, paved roads, and broadband. Many Colonias are neighborhoods in unincorporated areas under County jurisdiction. They can also be extra jurisdictional territories around cities, or incorporated communities (small towns).

As the Federal Reserve Bank of Dallas noted in the last full report about the status of the Colonias in 2015, *Las Colonias in the 21st Century: Progress Along the Texas-Mexico Border*[5], 61.4 percent of Colonia residents lived below or near poverty. Cameron, Hidalgo, and Starr Counties are among the counties along the border with the highest concentration of Colonias. The Colonias are recognized by federal agencies as vulnerable communities that should be targeted for investment.

The Federal Reserve's Colonias report and website, and its subsequent report, *Closing the Digital Divide: A Framework for Meeting CRA Obligations*[6], also document that broadband is an additional basic infrastructure and service severely limited in Colonias and in the persistent poverty counties of the region.

Colonias, particularly those with a substantial young population as is the case in Sullivan City, experience profound disadvantages due to the absence of broadband infrastructure. These underserved communities often grapple with limited access to educational resources, inhibiting the learning potential and opportunities for young individuals. Without reliable internet connectivity, accessing online educational materials, participating in virtual classes, and conducting research for academic purposes becomes severely challenging.

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[4] Barton-Garcia, J., & Cruz, M. (2023). SOUTH TEXAS PROFILE: The Rio Grande Valley (RGV) Broadband Coalition [Review of SOUTH TEXAS PROFILE: The Rio Grande Valley (RGV) Broadband Coalition].

[5] Las Colonias in the 21st Century Progress Along the Texas-Mexico Border Federal Reserve Bank of Dallas Community Development Economic Opportunity Infrastructure Housing Health Education Methodology. (n.d.). Retrieved September 18, 2023, from https://img1.wsimg.com/blobby/go/44376d3c-e549-4595-b195-94de46f78903/LasColoniasPDF.pdf

[6] Closing the Digital Divide A Framework for Meeting CRA Obligations Federal Reserve Bank of Dallas Community Development. (n.d.). https://www.dallasfed.org/-/media/Documents/cd/pubs/digitaldivide.pdf

This digital divide exacerbates disparities in educational attainment, hindering the development of essential skills needed for future success. Additionally, the lack of broadband stifles economic growth and limits access to telecommuting or remote work options for both young adults and parents in Colonias, further constraining financial prospects and perpetuating the cycle of limited opportunities within these communities. Bridging this digital gap is vital to empower the youth in Colonias, fostering educational advancement, skill development, and broader economic participation.

2.5.3 Latino Populations

As detailed in Table 5, the RGV region is over 90 percent Latino. The underinvestment in fiber infrastructure or network upgrades in these communities is called "digital redlining." This occurs when mostly large incumbent Internet Service Providers (ISPs) calculate that capital investments in low-income neighborhoods and rural areas necessary for 21st century broadband infrastructure and upgrades will not allow them to maximize profits (required by shareholders). In his book, Farm Fresh Broadband, Dr. Christopher Ali calls this practice "the politics of good enough," where low-income, rural, and Black, Indigenous and People of Color (BIPOC) communities are told they should accept whatever service is available and rely on expensive and unreliable satellite service or legacy infrastructure such as DSL technology and early cable modem network architecture.

Table 5:RGV Percent Hispanic or Latino

Rio Grande Valley Percent Hispanic or Latino	
Starr County	96.3%
Hidalgo County	92.6%
Cameron County	90.0%
Willacy County	88.1%
Source: U.S. Census QuickFacts, 2022	

The ISP reported data for the FCC Federal Broadband Map claims that 100 percent of RGV residents have "access" to broadband at 250/25 Mbps. The FCC defines "access" as meaning that the ISP reports they "can serve" the location, community, or neighborhood in 10 days. However, the self- reported data by ISPs is not consistent with actual experience and local context, and reports by the U.S. Census, the Federal Reserve Bank of Dallas, Brookings Institute, and the National Digital Inclusion Alliance. The actual quality and cost/affordability of service is not included in the map.

In summary, the map fails to incorporate appropriate research methodologies and does not layer the relevant datasets from the U.S. Census American Community Survey of actual fixed broadband subscriptions, local surveys, speed test data, and poverty data that would help provide a more accurate picture of the digital divide and the basis for an equitable investment of IIJA funds. The U.S. has the highest cost of internet service compared to other developed countries and low-income people and regions are most impacted by the digital divide, yet there is no consideration for affordability of service in determining unserved and underserved by the Texas BDO under the current grant eligibility rules.

2.5.4 Impact

The Texas Broadband Development Office (BDO) will incorporate Texas' regional plans, such as the RGV Broadband and Digital Equity Plan, into the Texas Digital Opportunity Plan which will lay the groundwork for investment in South Texas from the Bipartisan Infrastructure Investment and Jobs Act (IIJA), through grant programs administered by the BDO. Thus, the work of the RGV Broadband Coalition is vital to closing the digital divide, breaking the cycle of persistent poverty, and creating opportunities for upward mobility, business development, health equity, and prosperity in the South Texas region.

3 PUBLIC OUTREACH

As an integral component of Hidalgo County's Broadband Improvement Initiative, it was imperative to engage with the local community to ensure that their broadband requirements were accurately reflected. Our outreach efforts at CobbFendley played a pivotal role in assessing a wide spectrum of factors, ranging from the existing infrastructure to potential collaboration opportunities. This initiative significantly heightened community awareness and active participation in our survey, ensuring that the feedback received truly represented the community's perspective. This collective outreach effort was instrumental in providing context to the additional data points gathered during the Needs and Gaps Analysis phase. Ultimately, it enabled the project team to make informed decisions about the feasibility and scale of broadband expansion initiatives across the County.

3.1 Community Engagement

In this study, Hidalgo County placed a high priority on conducting a comprehensive and inclusive community outreach initiative. The aim was to ensure that the residents were adequately represented and that their needs could be accurately considered as the County pursued its broadband expansion endeavors. In addition to organizing discovery sessions with regional partners and private companies, a collaborative effort involving County leaders and community partners led to the development of a robust public engagement strategy.

This strategy was meticulously crafted to foster ongoing opportunities for feedback, with a primary focus on educating and inviting commentary from the community. To achieve this, the project team implemented a survey and speed test, providing a platform for residents to express their views and experiences regarding broadband services. The survey played a critical role in gaining insights into the prevailing sentiments and specific broadband requirements of the residents. The subsequent analysis of the County's current conditions, based on the data collected through this survey, is presented in the forthcoming figures and data points.

It was of paramount importance to ensure widespread participation in this survey, and considerable efforts were made to achieve this goal. Local communication channels were leveraged and enlisted the support of regional partners to maximize the survey's distribution and encourage a substantial number of responses.

3.1.1 Stakeholder Engagement

Public outreach also included stakeholder engagement, which helped CobbFendley evaluate everything from existing conditions to potential partnerships, as well as increased awareness and participation in the survey to ensure feedback from the community was well represented. A community outreach effort was a top priority for Hidalgo County in the study, to ensure that residents and local leaders were well represented and that their needs could be accurately considered in the County’s efforts to expand broadband. In addition to the discovery sessions with regional partners, stakeholders, and private companies, the project team designed a public engagement strategy in collaboration with County leaders and community partners to ensure effective public outreach.

In stakeholder outreach, involving local leaders plays a crucial role as they possess an intimate understanding of their communities' unique requirements and aspirations. Collaborating with local leaders helps identify the specific needs and priorities that must be addressed to bridge the digital divide effectively. Simultaneously, engaging broadband service providers is equally essential, as they offer insights into the existing infrastructure, technological capabilities, and market dynamics. This collaboration not only ensures that new broadband initiatives build upon the current infrastructure but also allows for a comprehensive understanding of potential future developments, ensuring a strategic and sustainable approach to expanding connectivity access for all.

Educational outreach has been another major component of the broadband feasibility study and the statewide and regional planning, educational, and workforce efforts. Hidalgo County educational institutions have been identified as being among the organizations which have the greatest amount of influence and trust among unserved and underserved communities. These relationships, often multi-generational, serve as regional pillars for the purposes of accumulation of data, dissemination of information, and serve as platforms to roll out new educational as well as technological programs.

The efforts of the County working together with local school districts and institutions of higher learning to provide critical services during the global pandemic has provided an ecosystem built on trust and proven deliverables to the community. Constant communication and collaboration during the broadband feasibility study period has further increased the exchange of information and paved the way for eventual success in increasing digital literacy and eliminating the digital divide in Hidalgo County.

As a part of the stakeholder process, key questions were posed to gauge their broadband requirements, such as desired internet speeds, coverage areas, and specific use cases like telemedicine, remote learning, or e-commerce. These inquiries not only provide valuable insights into the technical and service-related aspects of broadband expansion but also helped in aligning project objectives with the unique expectations of the stakeholders, ensuring a more tailored and effective broadband infrastructure deployment.

Overall, the Stakeholders Engaged as a Part of the Hidalgo County Broadband Feasibility Study were:

- Arise
- Charter
- County Judge Cortez
- Crista Vinson, Rural LISC
- Dylan Adams, regional Veterans Issues advocate
- Extreme C-Suite in Boston
- Fiber Broadband Association
- Fiberlight
- Gigabit
- Hidalgo Co. Pct. 3
- Hidalgo Count Emergency Management Department
- Hidalgo County Precinct 4 with Commissioner Elie Torres and staff.
- Hidalgo County IT Department
- Hosted Texas A&M - McAllen students.
- Jennifer Harris, NTIA
- Joe Bryant & Kevin Alfaro
- La Unión Del Pueblo Entero (LUPE)
- LevelUp RGV: Digital Workforce Development Program
- Local Initiatives Support Corporation (LISC)
- Region 1 Texas Education Service Centers
- Rep. Vicente Gonzalez in DC
- Resound Networks
- Senior National Telecommunications and Information Administration (NTIA) officials at the Department of Commerce.
- SmartCom
- South Texas College
- Texas Association of Governmental Information Technology Managers (TAGITM)
- Texas Broadband Development Office (BDO)
- TX Rep. Trent Ashby
- US Rep. Rick Larsen, House Infrastructure Chairman
- Vexus Fiber
- VTX1
- White House Fellow Vanessa Covarrubias

3.2 Rio Grande Valley Broadband Coalition[7]

The RGV Broadband Coalition, comprised of various organizations including the Lower Rio Grande Valley Development Council (LRGVDC), local governments, educational institutions, and businesses such as VTX1 Companies and Lone Star National Bank, has been tasked with devising a comprehensive regional broadband strategy in the Rio Grande Valley. This collaborative effort spans a diverse array of stakeholders, including community advocacy groups like La Union Del Pueblo Entero (LUPE), with an aim to address broadband accessibility issues in the Cameron, Hidalgo, Starr, and Willacy counties. As the initiative progresses, additional partners will be incorporated into the coalition, broadening its reach to enhance broadband connectivity across the region.

3.2.1 RGV Broadband Coalition Programs

Regional Expansion of High-Speed Broadband Infrastructure And Affordable Service:

Efficiency in deploying high-speed networks will be achieved with city and county government broadband engineering and feasibility studies and partnerships with local Internet Service Providers (ISPs) and anchor institutions.

Cameron County, City of Brownsville, City of Pharr, City of Harlingen, City of San Juan, and the City of Alamo have completed, or are currently underway (City of Mercedes), with their broadband feasibility studies. This Hidalgo County feasibility study will also be used for consideration.

Methodist Healthcare Ministries provided a $1 million grant to support the City of Pharr's municipal broadband utility, TeamPharr.Net. Valley Baptist Legacy Foundation provided a $191,000 grant to connect Harlingen Housing Authority residents with high-speed broadband in a partnership with Spectrum. Total cost for RGV infrastructure expansion TBD.

Level Up RGV Digital Workforce Programs: Broadband Network Design-Build- Maintenance;

Community Digital Navigators/Digital Citizenship; Information Technology (IT); Cybersecurity; Telecommunications & Information Technology Policy and Law. All training/degree/certification programs include paid internships/apprenticeships, professional development and customer service skills. The RGV Digital Workforce Team, under the RGV Broadband Coalition, has followed NTIA's Workforce Planning Guide, in identifying existing programs to expand and gaps in workforce preparation to incorporate new career credentials and experiential learning.

$125,000 planning grant from Rural LISC to IDRA to facilitate the RGV Broadband Coalition's Digital Workforce Working Group. Total cost of the program TBD.

Expanding Broadband Access and Digital Skills for Civic Participation:

A train-the-trainer program designed and led by La Union del Pueblo Entero (LUPE), ARISE Adelante, Intercultural Development Research Association (IDRA), Rural LISC, and CDCB, to teach Colonia and other underserved resident's digital skills through an interactive digital navigator program to apply their digital skills for community-organizing to advocate for human rights, educational equity, U.S. Census participation, access to infrastructure and safe housing, and more.

$50,000 grant from Connect Humanity ($25,000 each) for LUPE and ARISE to plan the digital navigator program as part of the Level Up RGV Digital Workforce Planning. Annual cost of the program TBD.

[7] Barton-Garcia, J., & Cruz, M. (2023). SOUTH TEXAS PROFILE: The Rio Grande Valley (RGV) Broadband Coalition [Review of SOUTH TEXAS PROFILE: The Rio Grande Valley (RGV) Broadband Coalition].

South Texas Small Business Broadband Fund:

A partnership for the RGV Region between Connect Humanity, the City of Pharr/TeamPharr.Net, Region One ESC, VTX1 Companies, SmartCom, BTX Fiber, Workforce Solutions Cameron, and Workforce Solutions (Starr, Hidalgo, Willacy) to address broadband affordability for high-speed internet, digital tools/platforms, and digital skills (digitalization) for microenterprise and small business, and nonprofits/community health centers.

$200,000 grant from the Ford Foundation to Connect Humanity. Total investment required, $10 million.

RGV Strategic Telehealth Expansion Plan:

A partnership between local governments, including the City of Pharr and Brownsville, local ISPs, Methodist Healthcare Ministries, Valley Baptist Legacy Foundation, University of Texas Rio Grande Valley Medical School, La Union Del Pueblo Entero, community health clinics, and nonprofits to ensure health care providers have necessary internet speed and capacity and that they collaborate with ISPs to connect communities and Colonias to provide robust telehealth services.

$75,000 Telehealth planning grant from Methodist Healthcare Ministries for the City of Brownsville. Total cost of the regional expansion TBD.

3.2.2 Public Residential Survey

As part of our community outreach efforts, a residential survey with an accompanying speed test was conducted to gather feedback from the community. The residential survey was launched on April 13, 2023, and remained open until June 30, 2023, garnering a total of 1,229 responses. This valuable dataset has been analyzed and integrated into the Needs and Gaps Analysis for our study.

The project team and County staff met individually with the Hidalgo County Judge and County Commissioner staff to understand each precinct's unique broadband needs, identify key areas of interest, and determine how to best promote the survey and speed test in their communities. County officials were instrumental in providing specific, targeted areas to focus door-to-door surveys.

The strategy focused on ensuring all materials were presented in bi-lingual messaging and utilized local communication outlets and press to gain widespread participation. There was also an ongoing opportunity for feedback to give multiple opportunities for residents to take the survey and speed test. The consultant team also recognized the need to provide more localized and individual outreach to underrepresented areas in the County and conducted door-to-door surveys to meet this need.

Through bi-weekly meetings, continuous improvement exercises were conducted to eliminate bottlenecks and barriers related to engagement in unserved and underserved areas. Of note was County management's intimate knowledge of Colonia areas which was passed on to the project team. A lesson learned from past feasibility studies conducted in South Texas which was applied to the Hidalgo County outreach effort for the first time was utilizing people familiar with the Colonias to conduct surveys. This effort lessened barriers to entry within these neighborhoods where the reduction of the digital divide is most needed.

The areas of focus for the door-to-door surveys were created based on the feedback from Commissioners and reviewing the existing FCC data maps for areas that seemed over-represented on the broadband coverage data. The door-to-door surveys were conducted over the course of several months and real-time results from the online survey and speed test were analyzed. Areas in the County that were underrepresented in the results were prioritized to take samples in the door-to- door campaign to try and fill in gaps in the data representation. Special consideration and attention were given to the Colonias throughout the County to make sure the members in these historically overlooked communities were represented.

Teams comprised of 2-3 bilingual speakers were dispatched with a script as well as flyers in both English and Spanish. Team members carried cell phones and tablets for assistance with the survey if necessary to help address the digital divide knowledge gap where applicable and gain accurate survey data. A snapshot of the survey results is shown below.

- 2,311 household surveys were conducted
- 602 residents spoken to
- 1,260 miles of neighborhoods surveyed
- 219 completed in-person surveys
- 59 speed tests conducted

It's worth noting that each question in the survey generated spatial data, allowing us to pinpoint the exact locations within the County where respondents provided their feedback if they chose to share their addresses. In cases where respondents did not provide their addresses, their responses were included in the overall count but were not incorporated into the spatial map.

In the following pages, a comprehensive exposition of the survey responses is presented, encompassing each response and its associated selection. The predominant selection chosen, is emphasized using bold formatting within each survey question. Corresponding figures have been thoughtfully included for comprehensive analysis and context.

Disclaimer: Survey Responses

The following figures and tables shown throughout this report illustrate the responses received through the Broadband Survey for Hidalgo County. All these responses have been captured from residents in the County and allow for human error, often some of the questions are answered but not all. This creates a fluctuation in the responses captured.

The following responses do not represent the County as a whole, but only represent the addresses from which the responses were recorded. The analysis will be a general representation of what other communities within the County may be experiencing, but it should not be assumed that overall trends shown throughout this survey are experienced throughout the County.

- Do You Have a Home Internet Connection? (Figure 16 and Figure 17)
  - **Yes (75%)**
  - No (25%)
- Why Do You Not Have a Home Internet Connection With a Local Service Provider? (Figure 18 and Figure 19)
  - Not Available (5%)
  - **Not Affordable (18%)**
  - Other (2%)- Other answers by residents included:
    - "Connection Unreliable"
    - "Cost for quality/speed of service is too high"
    - "In process of building and the only internet that will be available is very high in price"
    - "The internet available is very slow and expensive"
- Who is your Current Internet Service Provider? (Figure 20 and Figure 21)
  - **Spectrum/Charter (82%)**
  - AT&T (5%)
  - T-Mobile (5%)
  - Viasat (1%)
  - Other (7%)
- How Much Do You Pay Per Month for Internet (in USD, $) (Figure 22 and Figure 23)
  - 0-25 (3%)
  - 26-50 (12%)
  - 51-75 (25%)
  - **76-100 (40%)**
  - 101-125 (11%)
  - 126+ (9%)
- Do You Participate in The Affordable Connectivity Program? (Figure 24 and Figure 25)
  - Yes (26%)
  - **No (74%)**
- How Many People On Average Use The Internet At This Address On A Daily Basis? (Figure 26 and Figure 27)
  - 1-2 (29%)
  - **3-5 (61%)**
  - 6 or More (10%)
- How Do You Currently Use The Internet At Home? (Figure 28, Figure 29, Figure 30, Figure 31, Figure 32, Figure 33 and Figure 34)
  - Remote Work (Employed or Self-Employed) (20%)

  - Tele-Health for Healthcare Needs (13%)
  - **Entertainment (Streaming, Social media, Etc.) (35%)**
  - Education/School (29%)
  - Other (2%)
  - None of the Above (1%)
- Do You Work Remotely From Your Home Internet Connection? (Figure 35 and Figure 36)
  - Yes, Full-Time (15%)
  - Yes, Hybrid (11%)
  - Yes, As-Needed (32%)
  - **No (42%)**
- How Would You Rate The Following Factors Related to Internet Connectivity in Your Area? (Figure 37, Figure 38, Figure 39, Figure 40, Figure 41 and Figure 42)
  - Internet Provider Options
    - Very Poor (15%)
    - Poor (19%)
    - Neutral (24%)
    - **Good (32%)**
    - Excellent (10%)
    - N/A (0%)
  - Internet Availability and Coverage
    - Very Poor (9%)
    - Poor (17%)
    - Neutral (24%)
    - **Good (37%)**
    - Excellent (12%)
    - N/A (0%)
  - Internet Pricing
    - Very Poor (25%)
    - **Poor (38%)**
    - Neutral (24%)
    - Good (11%)
    - Excellent (2%)
    - N/A (1%)
  - Internet Reliability
    - Very Poor (9%)
    - Poor (17%)
    - Neutral (31%)
    - **Good (34%)**
    - Excellent (8%)
    - N/A (0%)
  - Internet Speed
    - Very Poor (7%)
    - Poor (17%)
    - Neutral (30%)
    - **Good (34%)**
    - Excellent (11%)
    - N/A (0%)

The data contained in Table 6 is derived from Figure 37 but is presented in a numerical format rather than graphically. To generate the data in Table 6, each response was assigned a score, with the options 'Very Poor,' 'Poor,' 'Neutral,' 'Good,' 'Excellent,' or 'Not Applicable' corresponding to values of -2, -1, 0, 1, and 2, respectively (responses marked as 'Not Applicable' were not scored). These values were then calculated based on the number of responses received. The questions in this section sought residents' opinions on provider options, coverage, pricing, reliability, and speed.

The responses to these questions exhibited a wide range of viewpoints, and Table 6 provides valuable additional insights into the overall sentiment. To gauge the prevailing consensus, a negative score in Table 6 aligns with the 'Poor' side of the spectrum, a positive value corresponds to the 'Good' side, and scores close to zero indicate a 'Neutral' sentiment.

As highlighted in Table 6, the lowest-scoring aspect was internet pricing. This indicates a general dissatisfaction with pricing, shedding light on the critical need for this study. Digital equity and adoption emerge as the fundamental drivers for enhancing broadband infrastructure in Hidalgo County, as underscored by these responses.

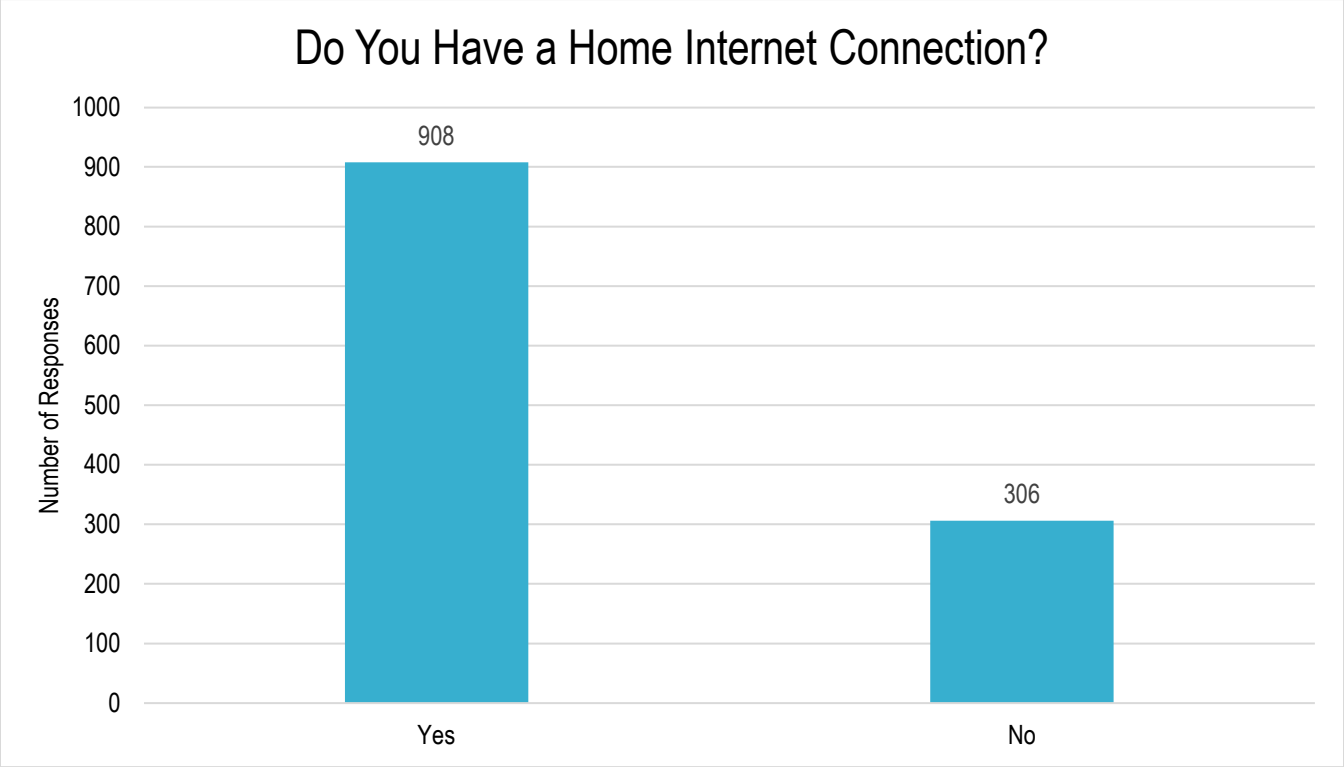

Figure 16: Do You Have a Home Internet Connection?

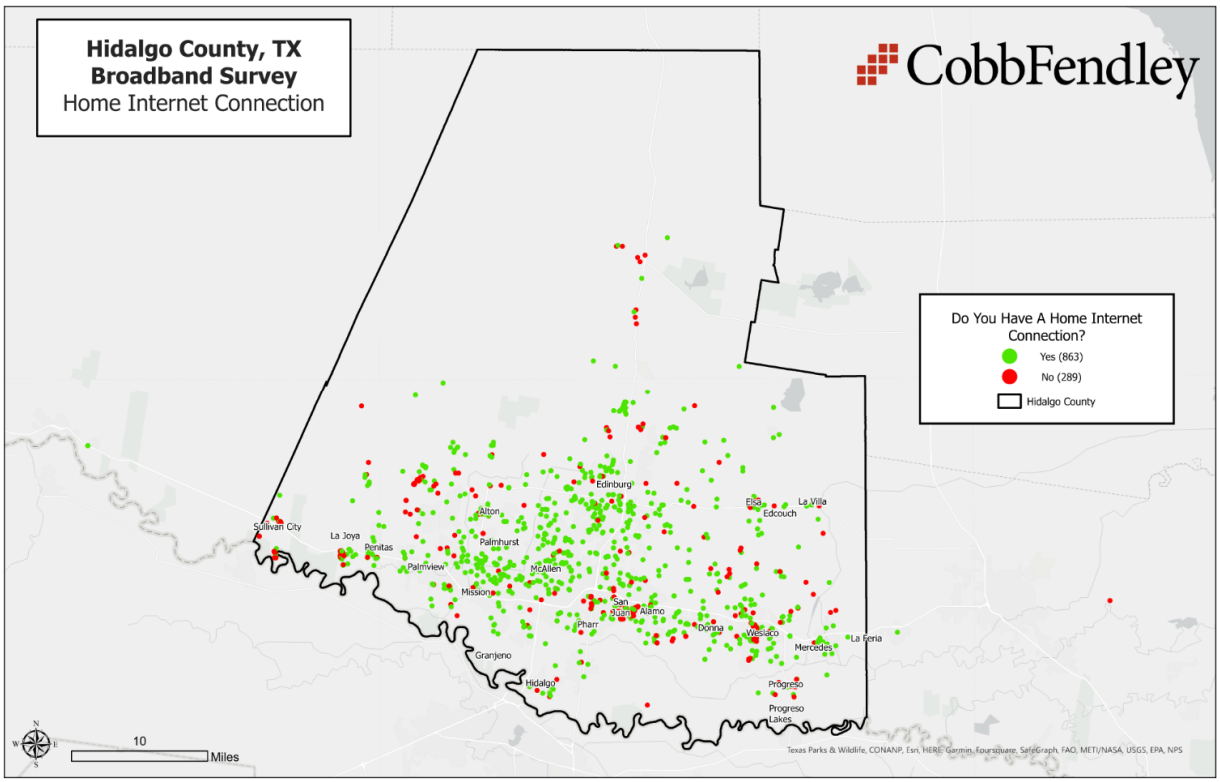

Figure 17: Do You Have a Home Internet Connection?

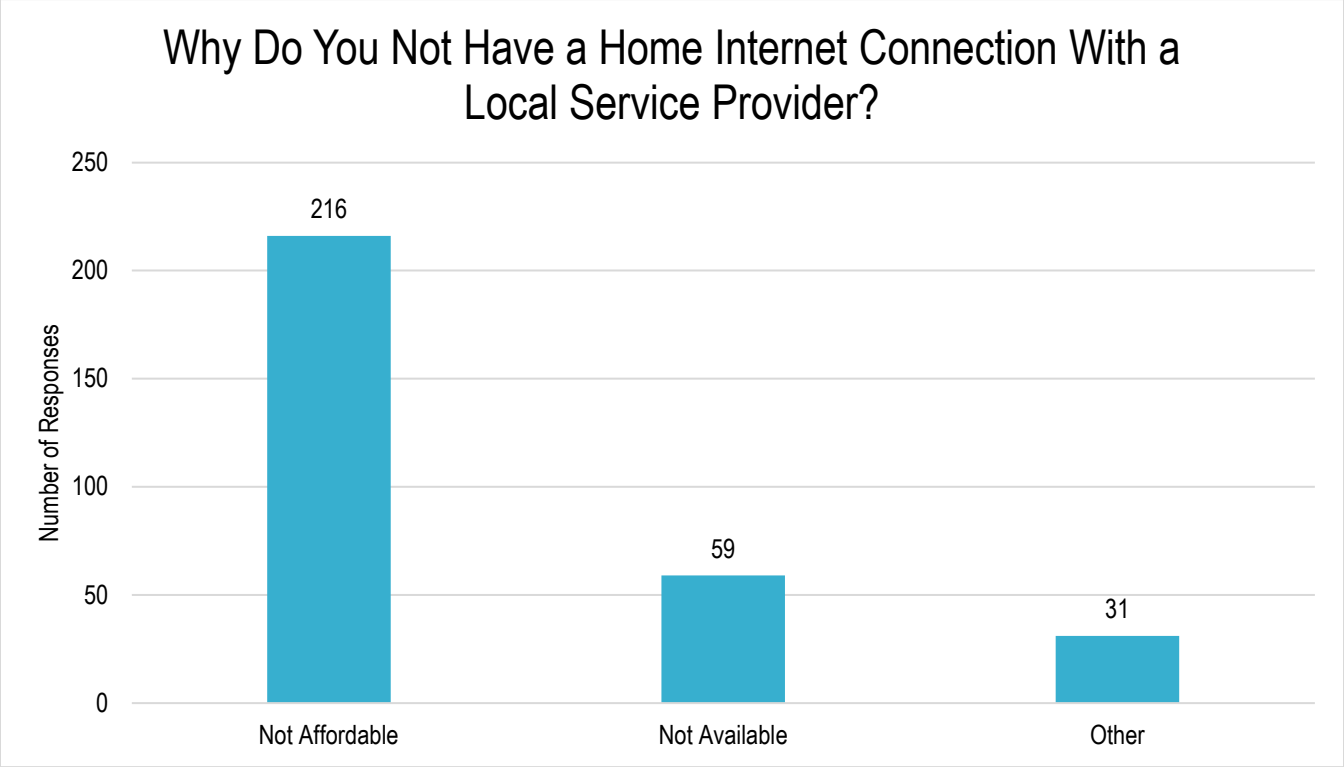

Figure 18: Why Do You Not Have a Home Internet Connection With a Local Service Provider?

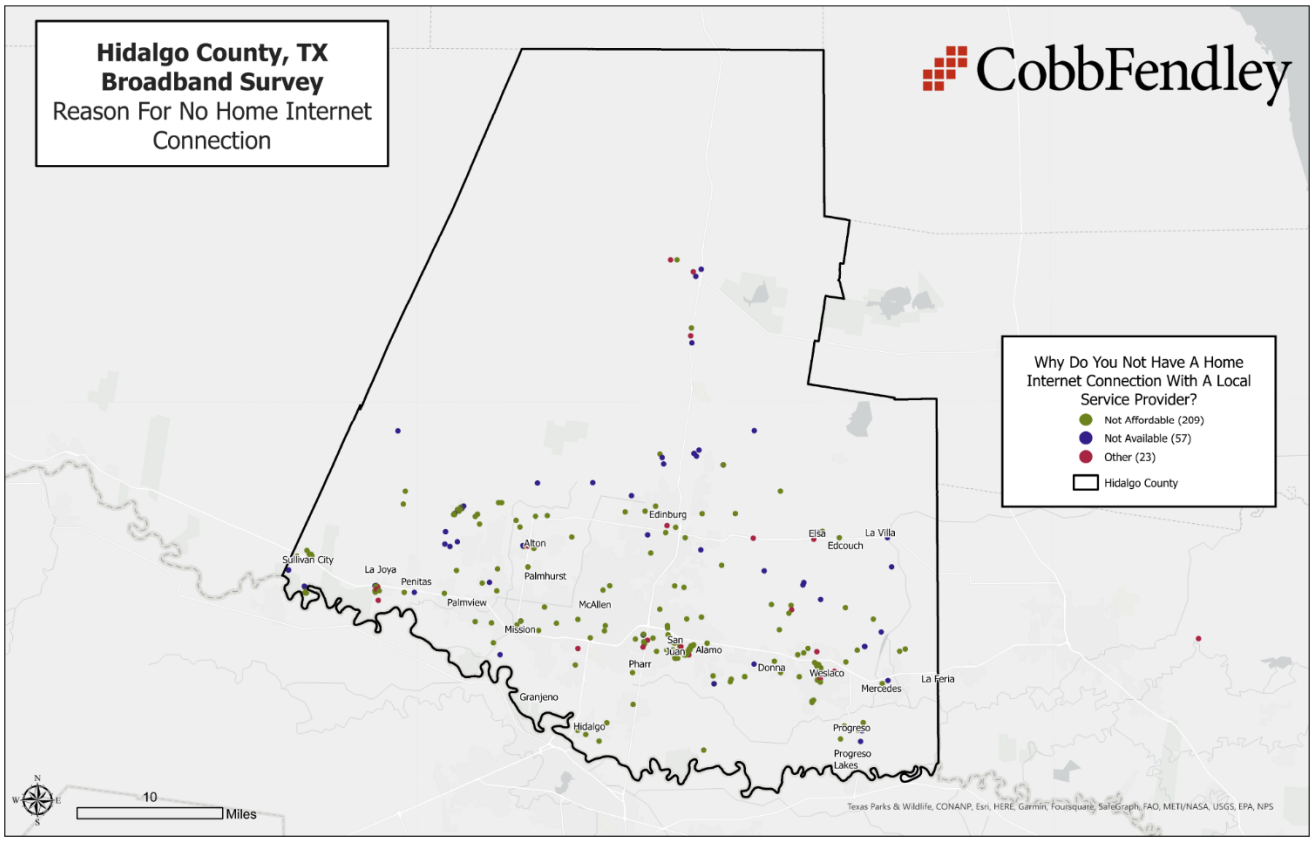

Figure 19: Why Do You Not Have a Home Internet Connection With a Local Service Provider?

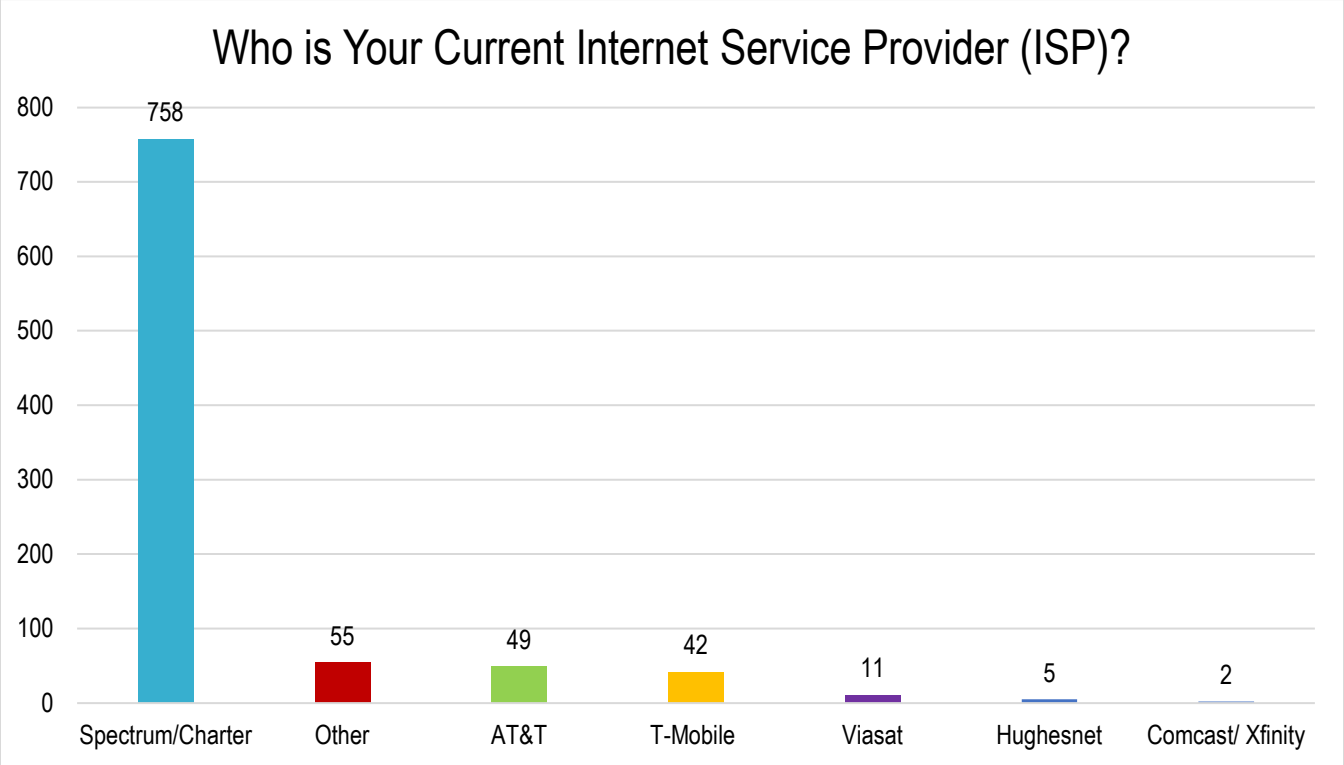

Figure 20: Who is your Current Internet Service Provider?

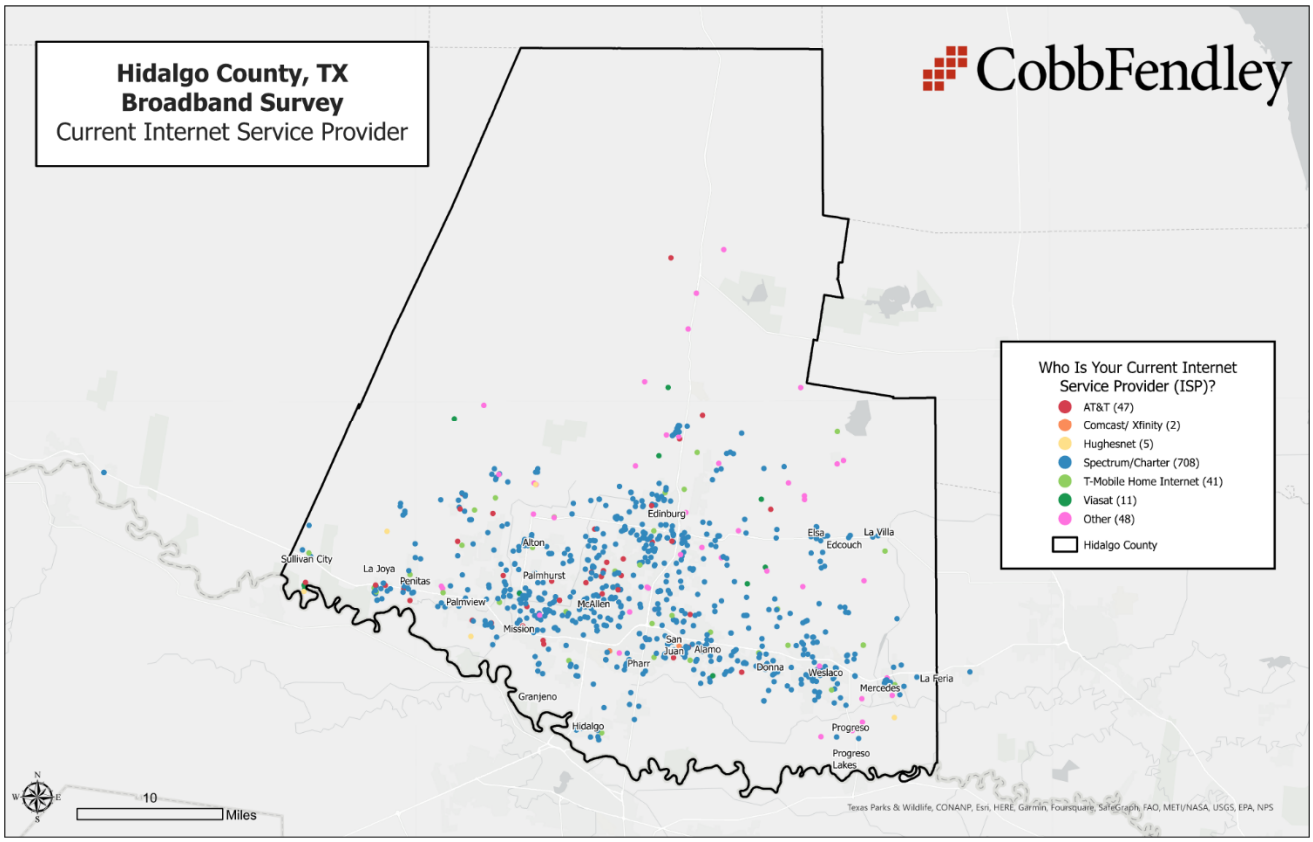

Figure 21: Who is your Current Internet Service Provider?

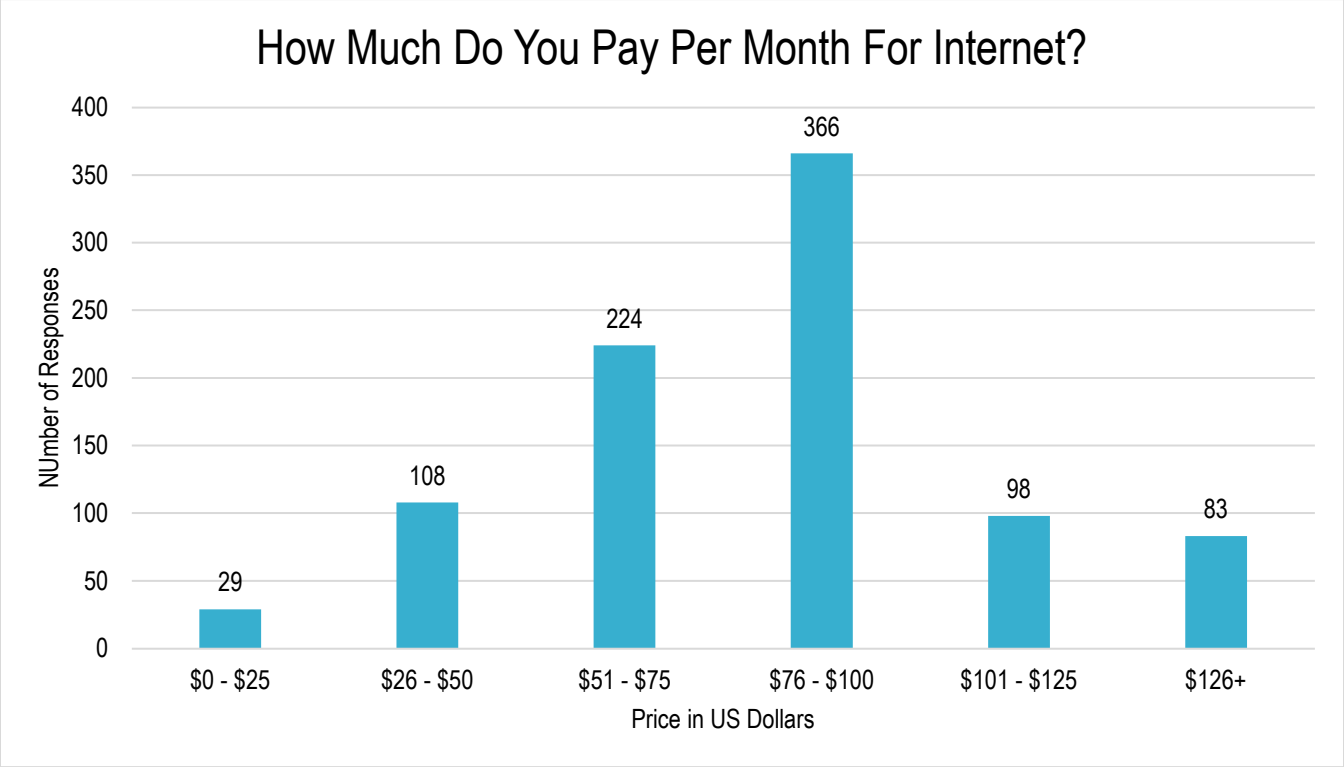

Figure 22: How Much Do You Pay Per Month for Internet?

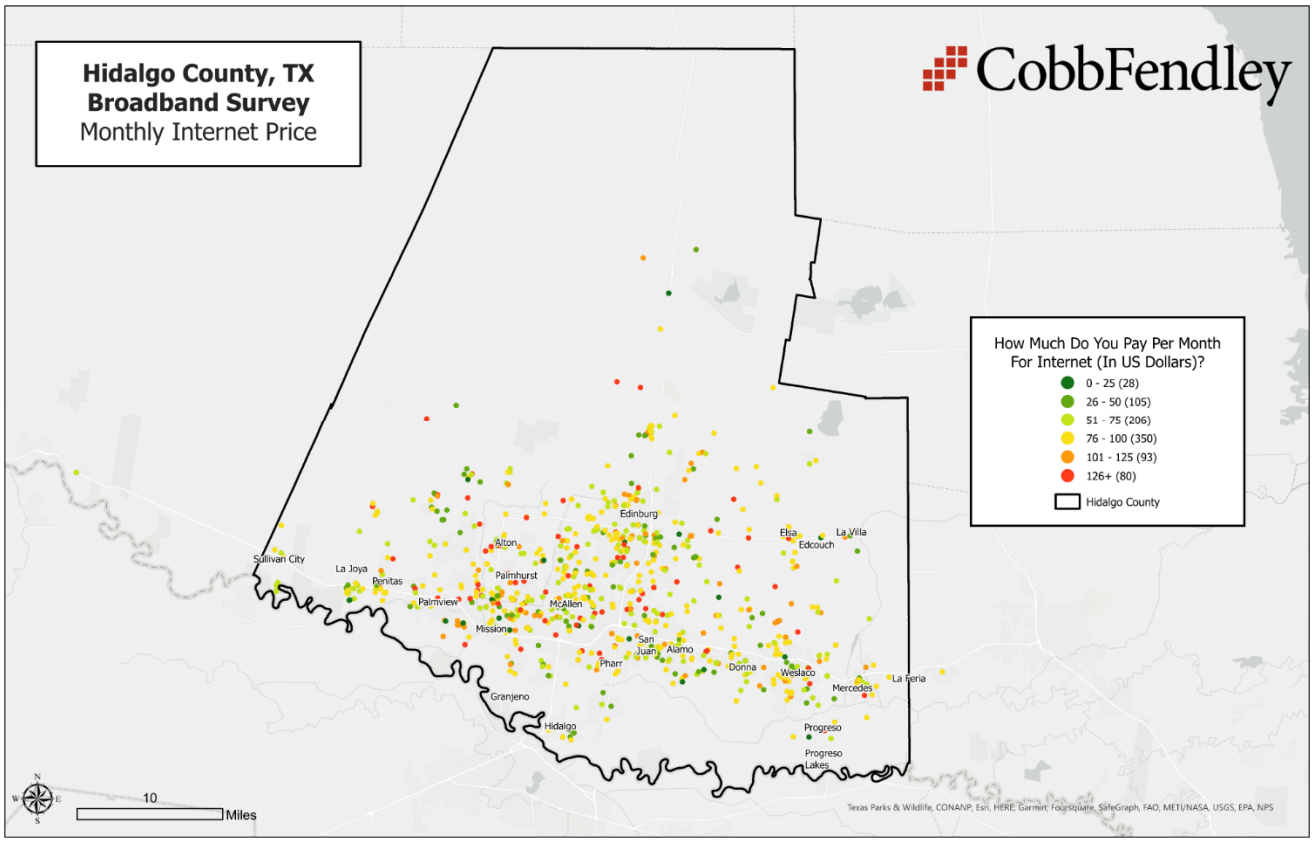

Figure 23: How Much Do You Pay Per Month for Internet?

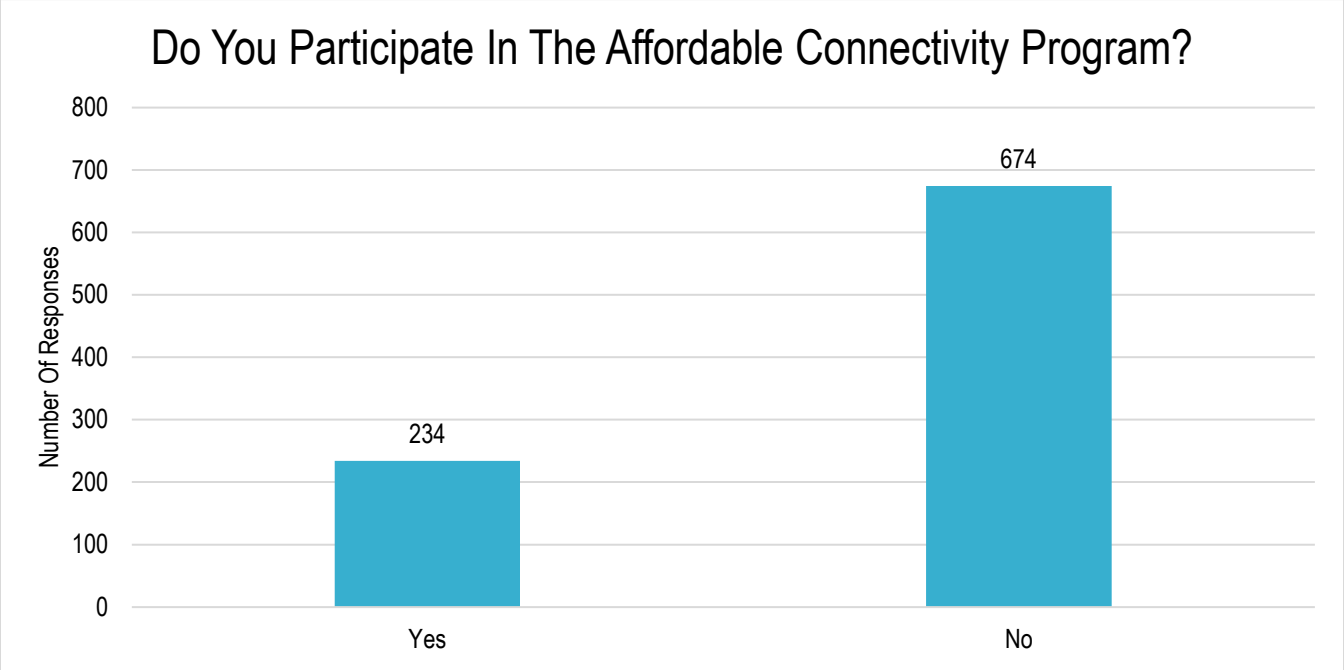

Figure 24: Do You Participate in The Affordable Connectivity Program?

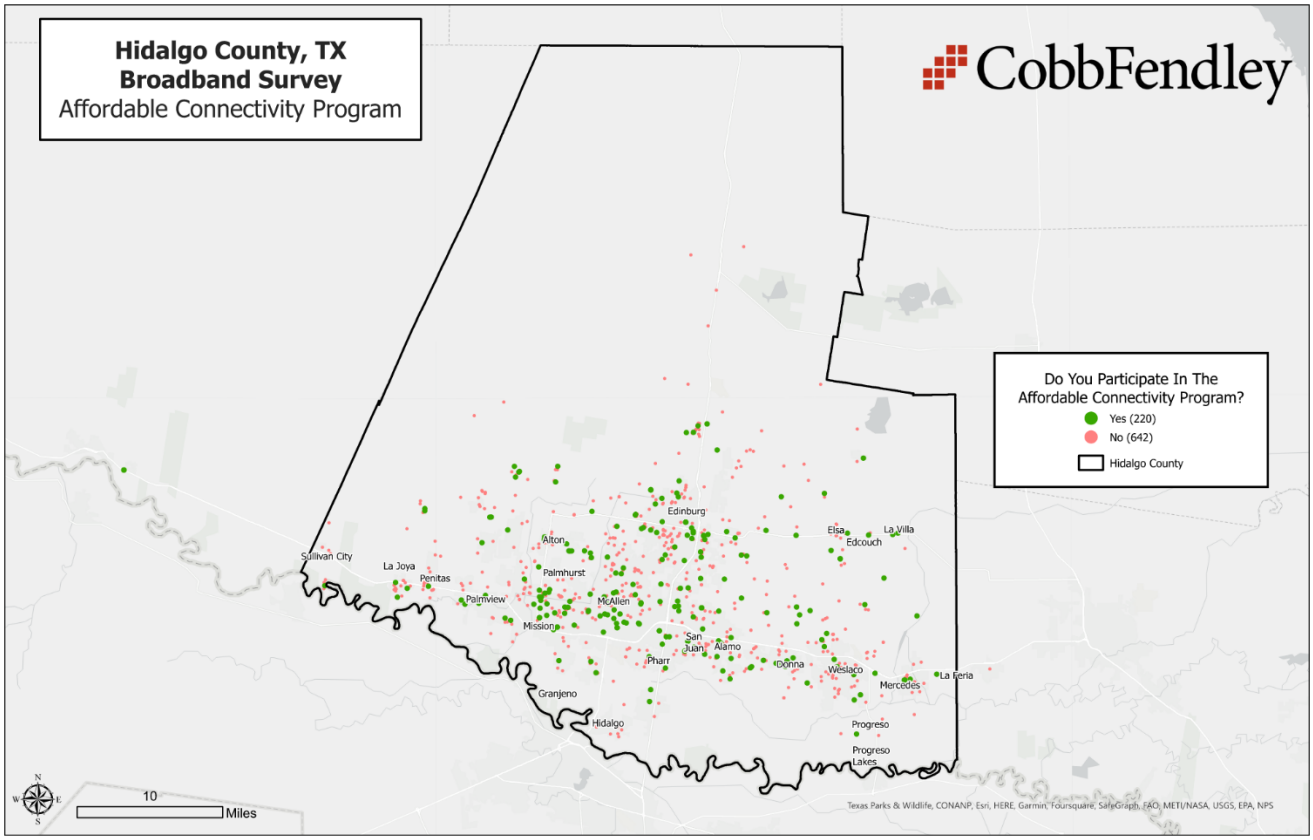

Figure 25: Do You Participate in The Affordable Connectivity Program?

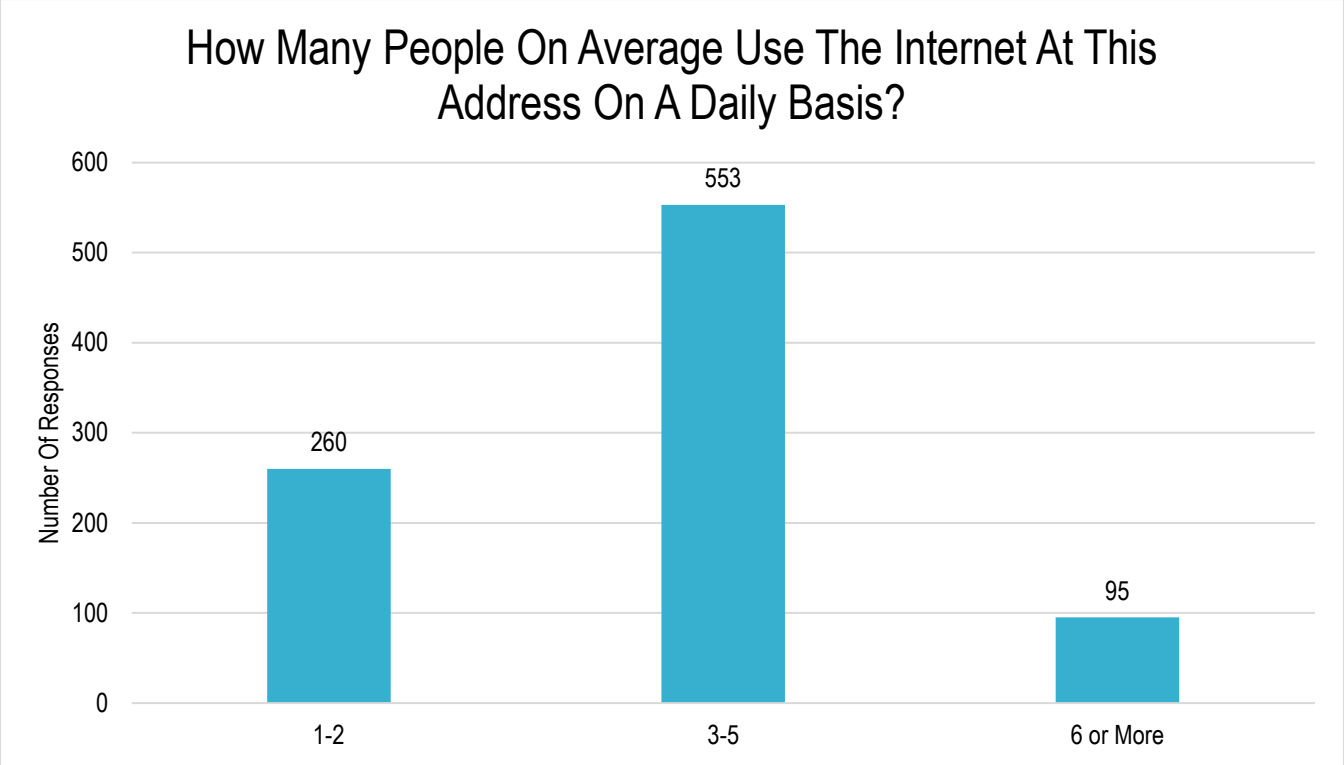

Figure 26: How Many People On Average Use The Internet At This Address On A Daily Basis?

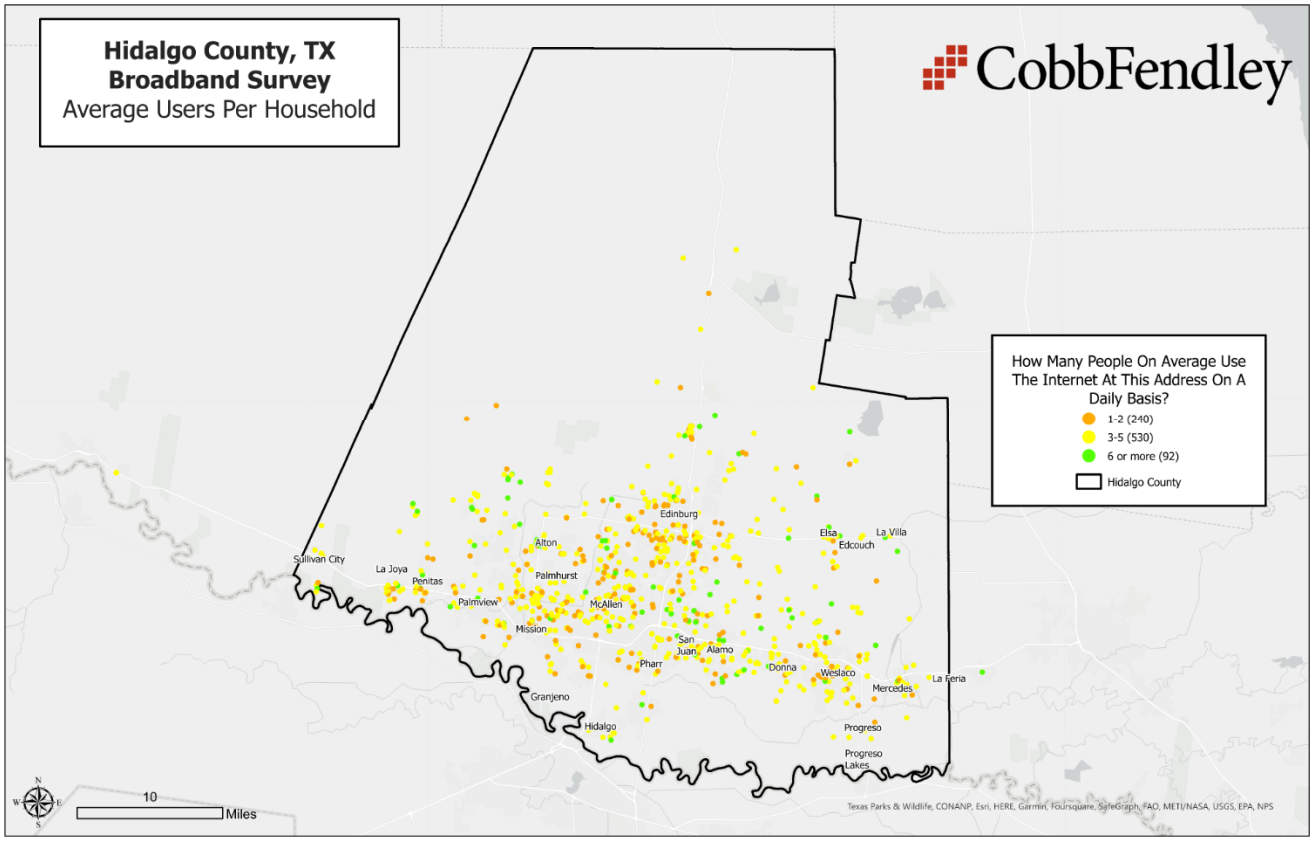

Figure 27: How Many People On Average Use The Internet At This Address On A Daily Basis?

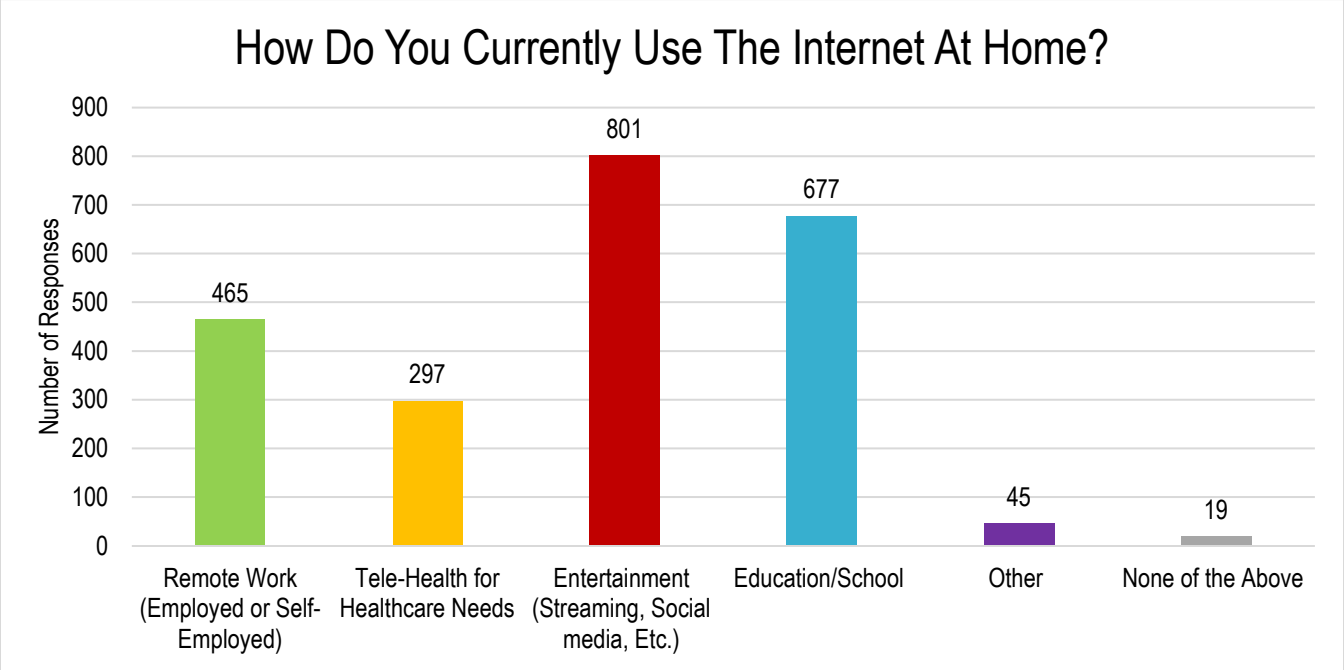

Figure 28: How Do You Currently Use The Internet At Home?

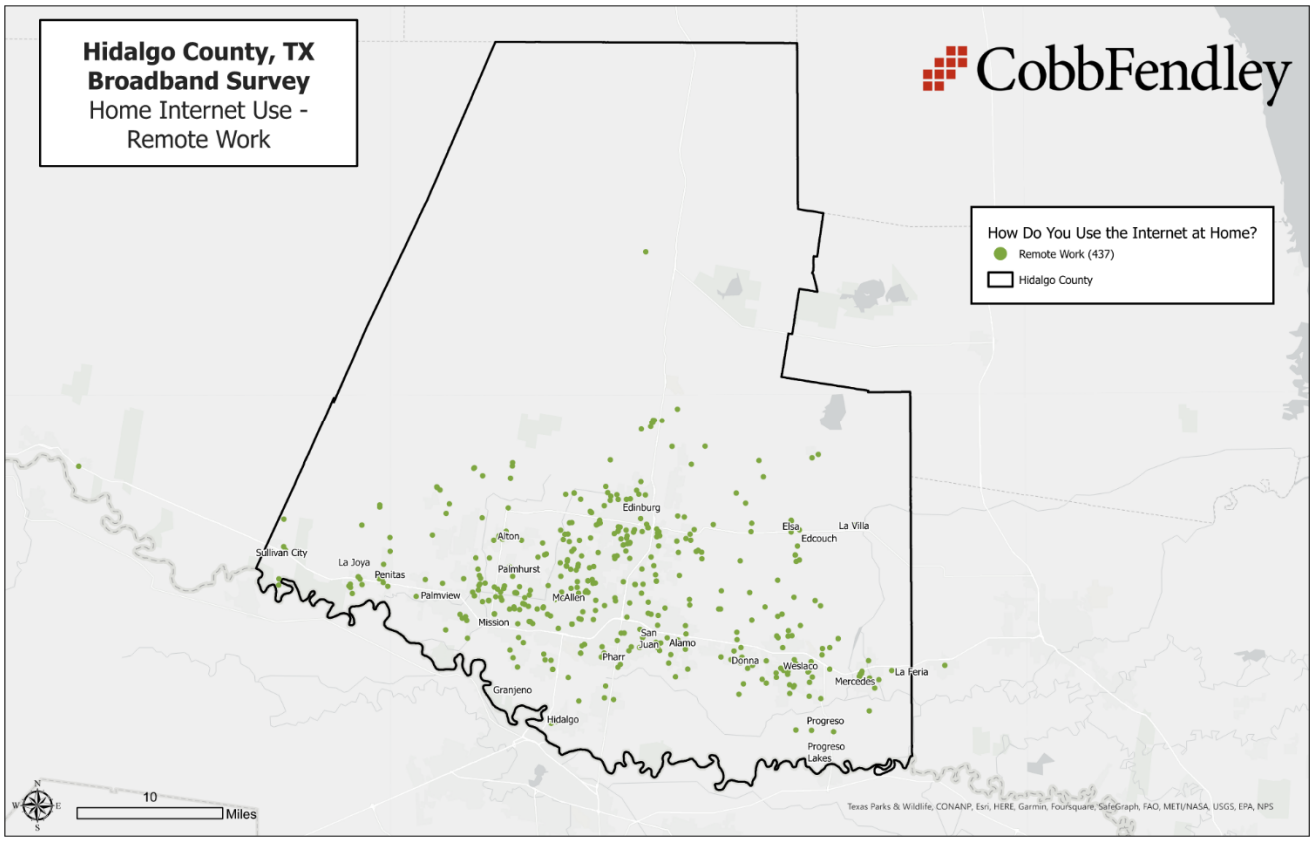

Figure 29: How Do You Currently Use The Internet At Home? Remote Work

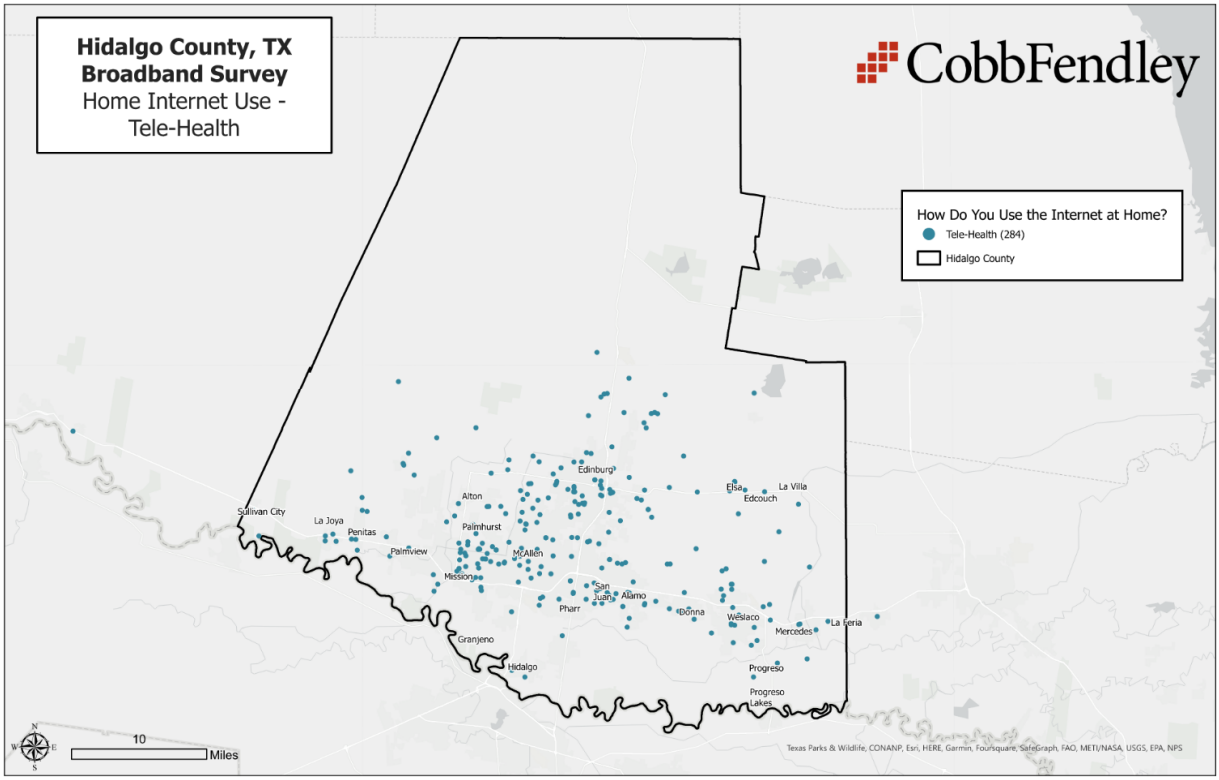

Figure 30: How Do You Currently Use The Internet At Home? Tele-Health for Healthcare Needs

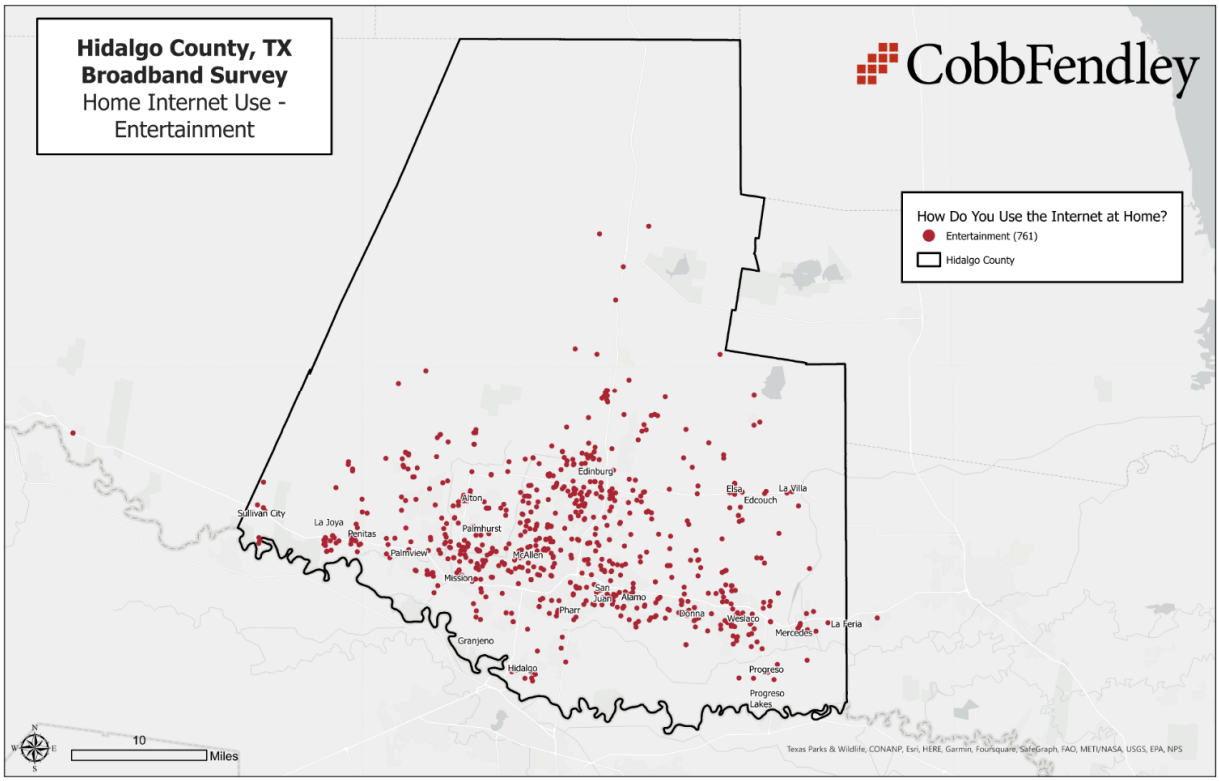

Figure 31: How Do You Currently Use The Internet At Home? Entertainment (Streaming, Social Media, Etc.)

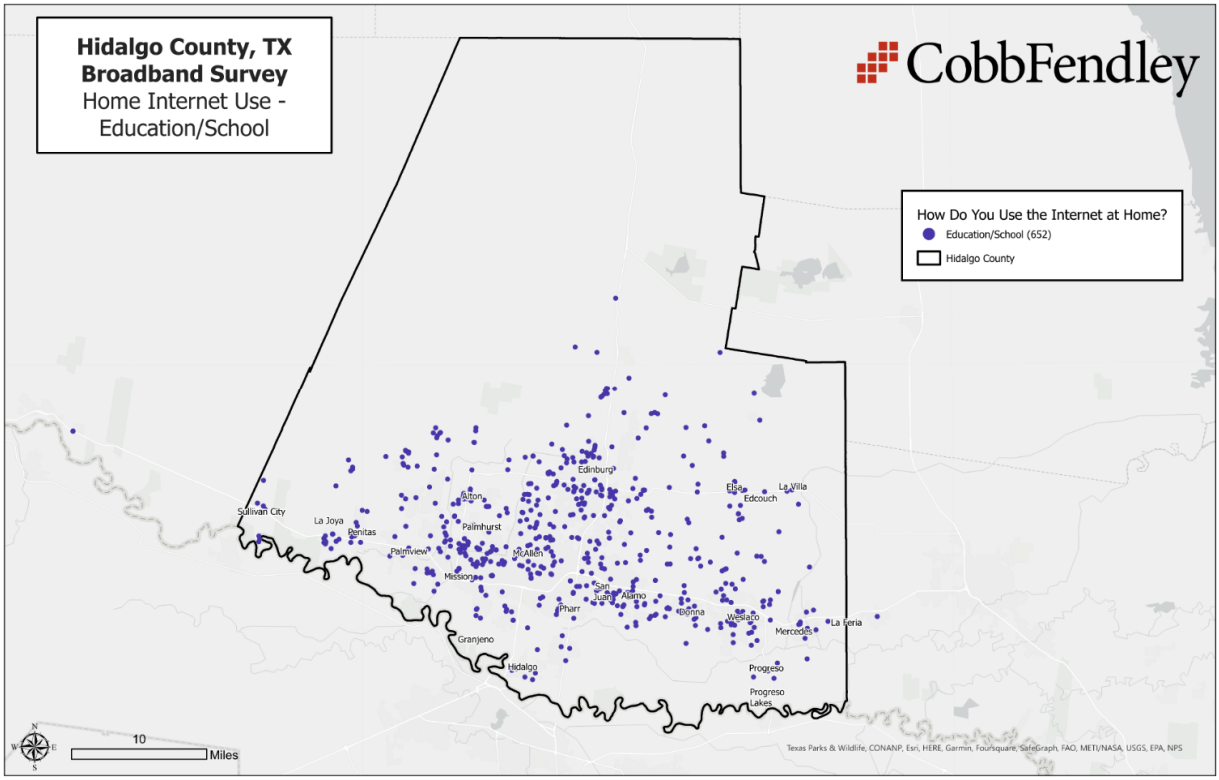

Figure 32: How Do You Currently Use The Internet At Home? Education/School

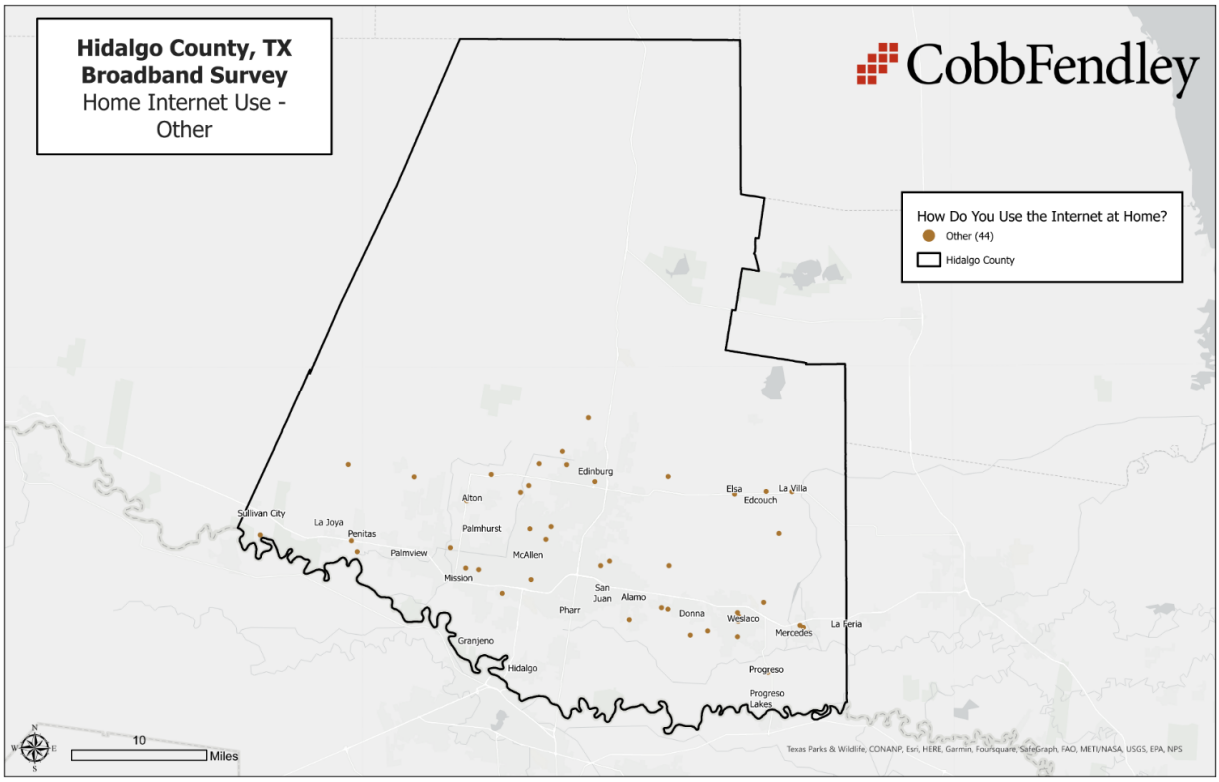

Figure 33: How Do You Currently Use The Internet At Home? Other

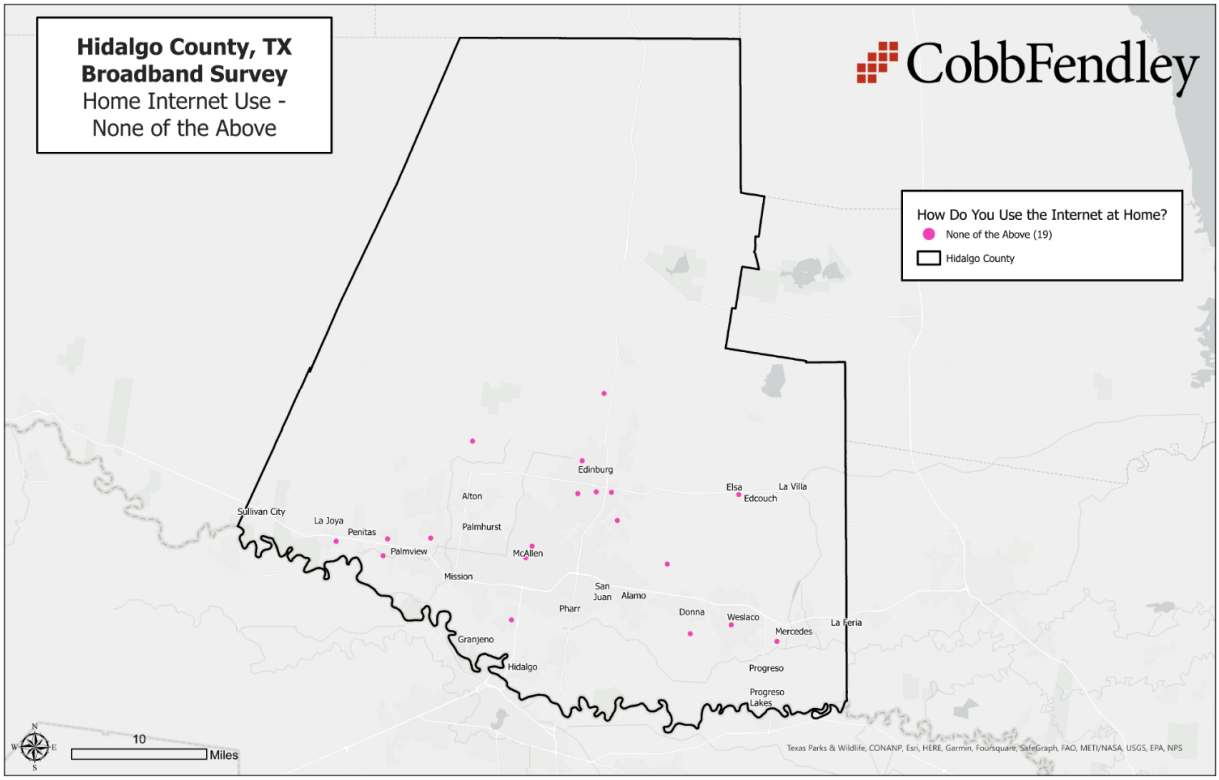

Figure 34: How Do You Currently Use The Internet At Home? None of The Above

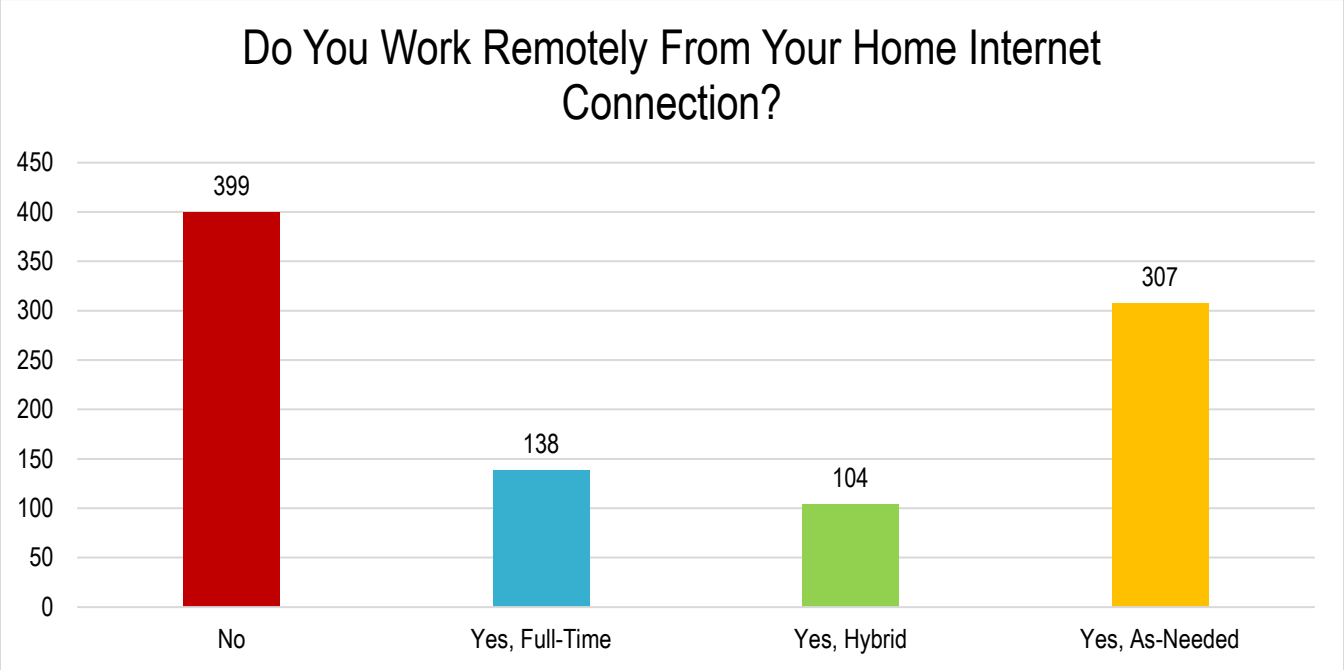

Figure 35: Do You Work Remotely From Your Home Internet Connection?

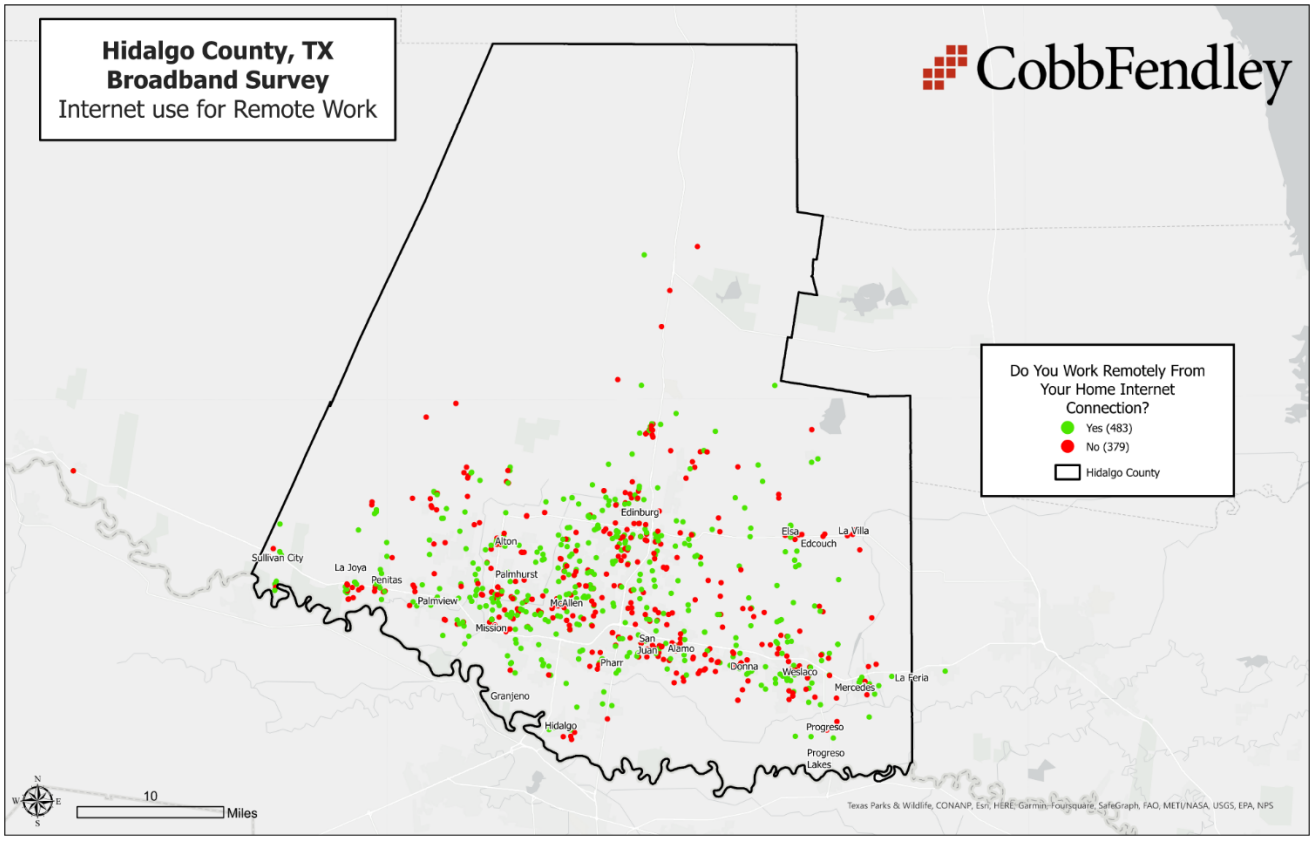

Figure 36: Do You Work Remotely From Your Home Internet Connection?

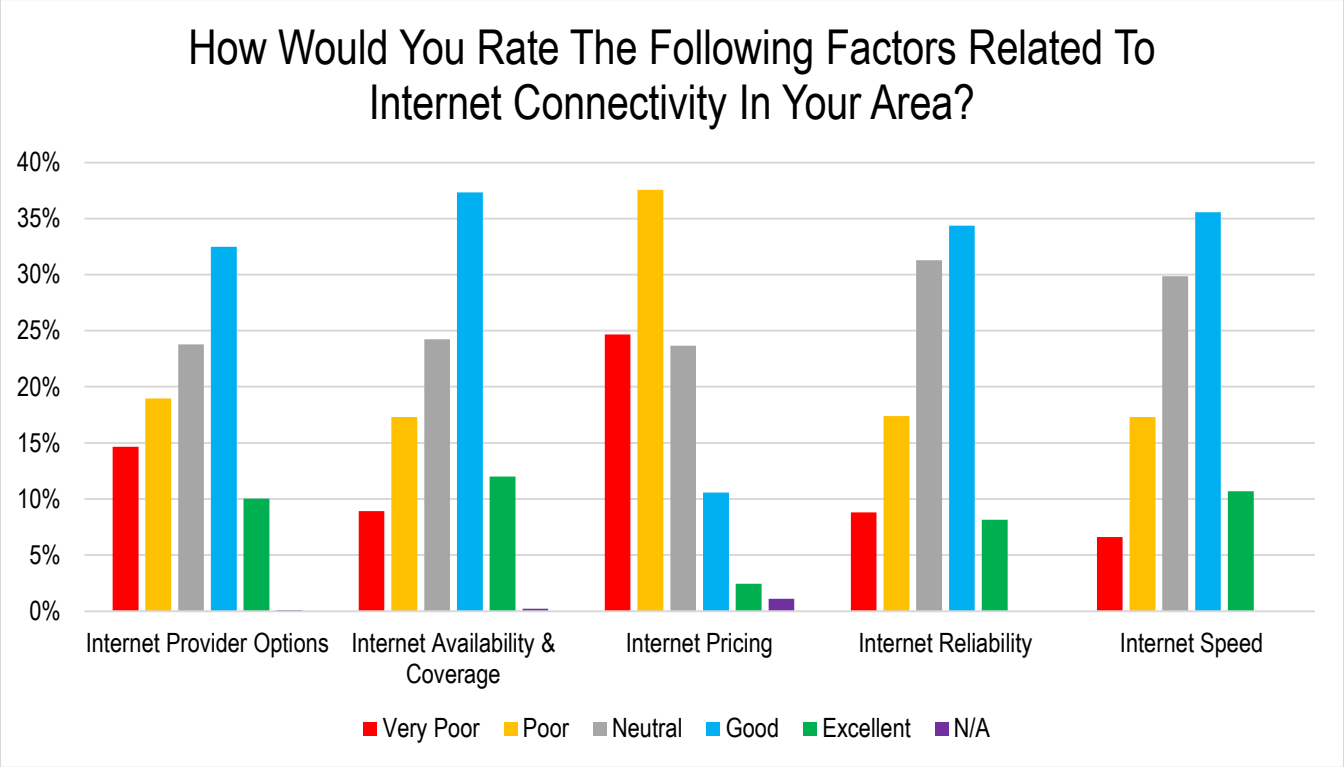

Figure 37: How Would You Rate The Following Factors Related to Internet Connectivity in Your Area?

Table 6: Survey Score Based on Internet Connectivity Ratings

Survey Score	
Internet Provider Options	39
Internet Availability & Coverage	238
Internet Pricing	-649
Internet Reliability	142
Internet Speed	240

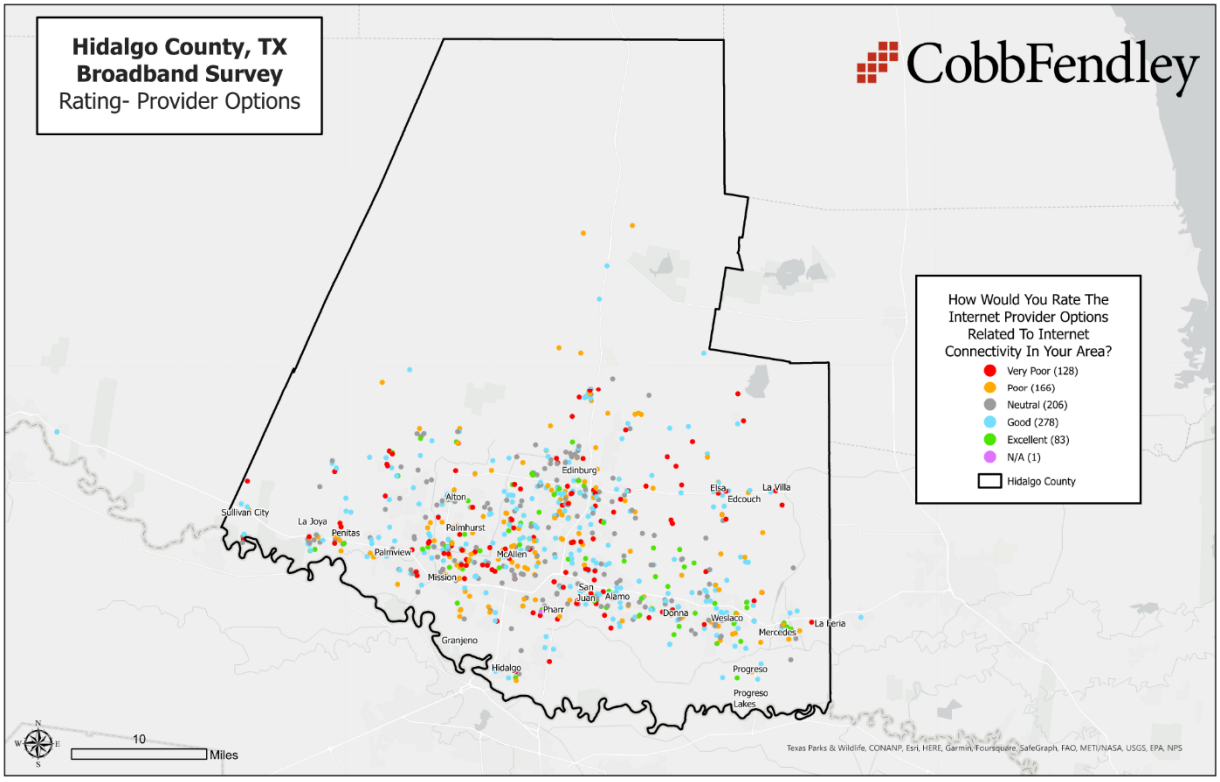

Figure 38: How Would You Rate Internet Provider Options in Your Area?

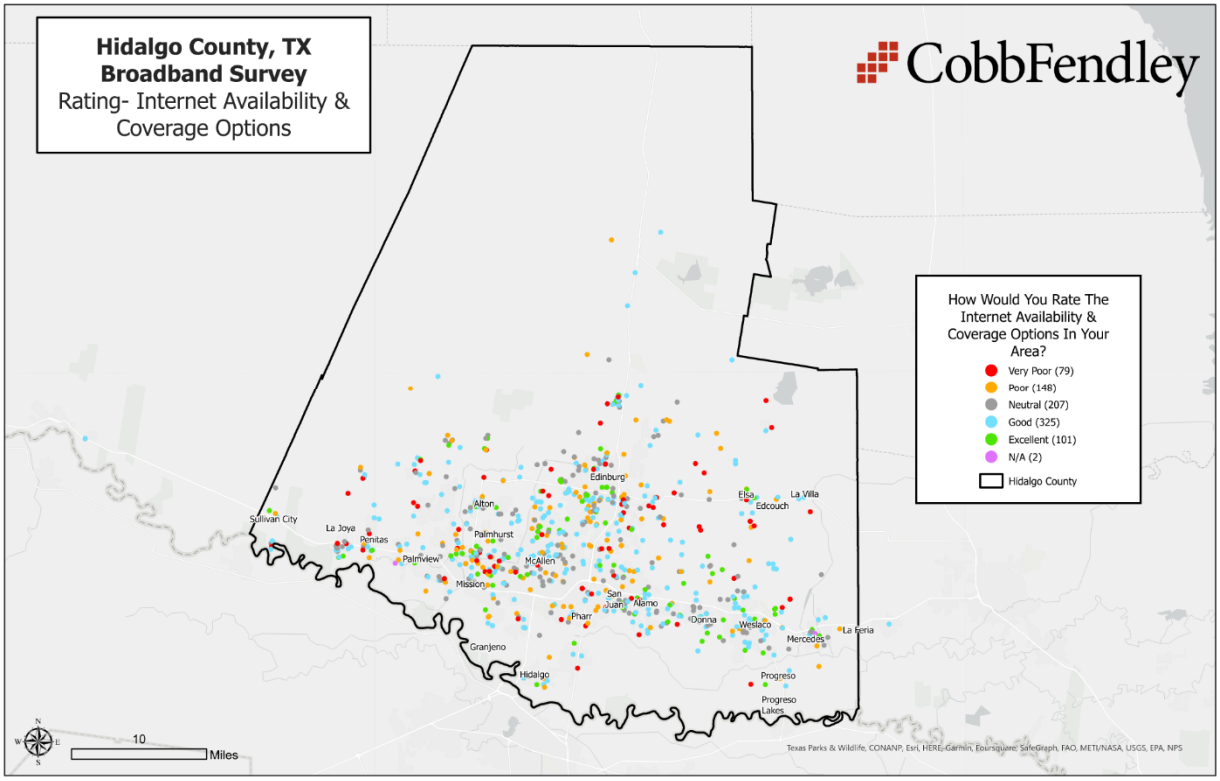

Figure 39: How Would You Rate Internet Availability & Coverage Options in Your Area?

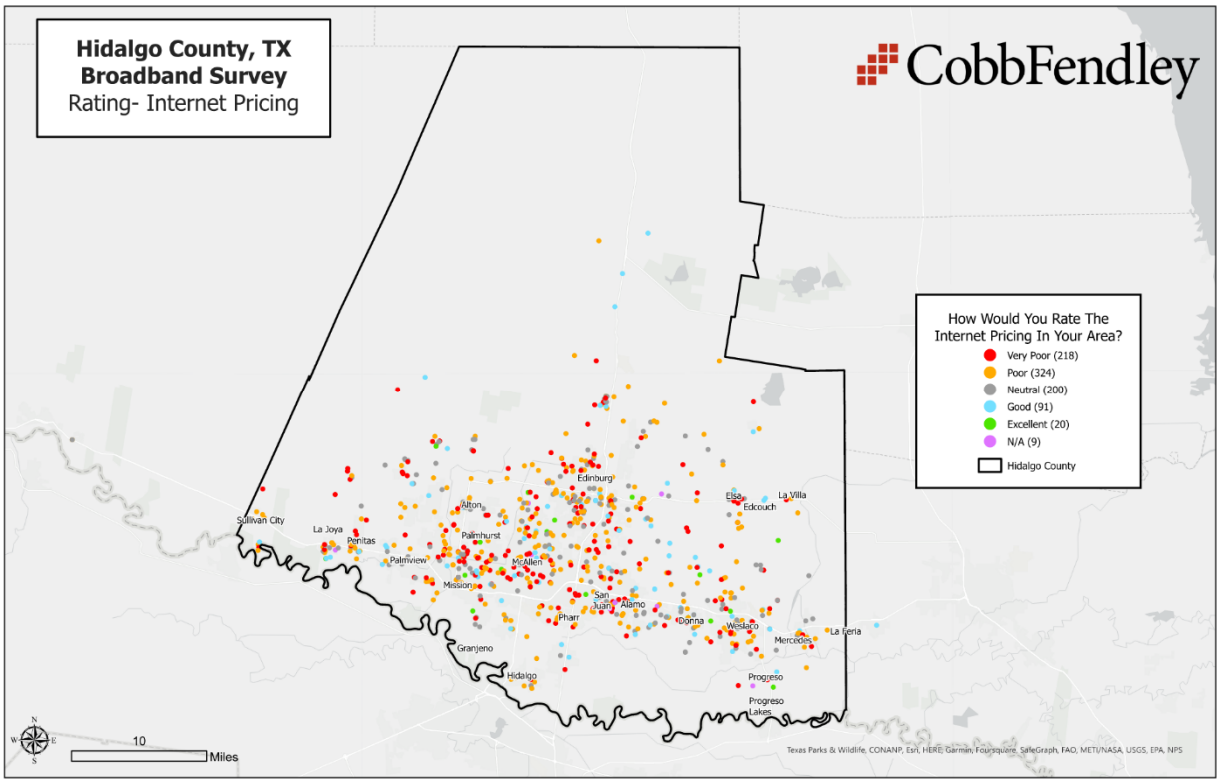

Figure 40: How Would You Rate Internet Pricing in Your Area?

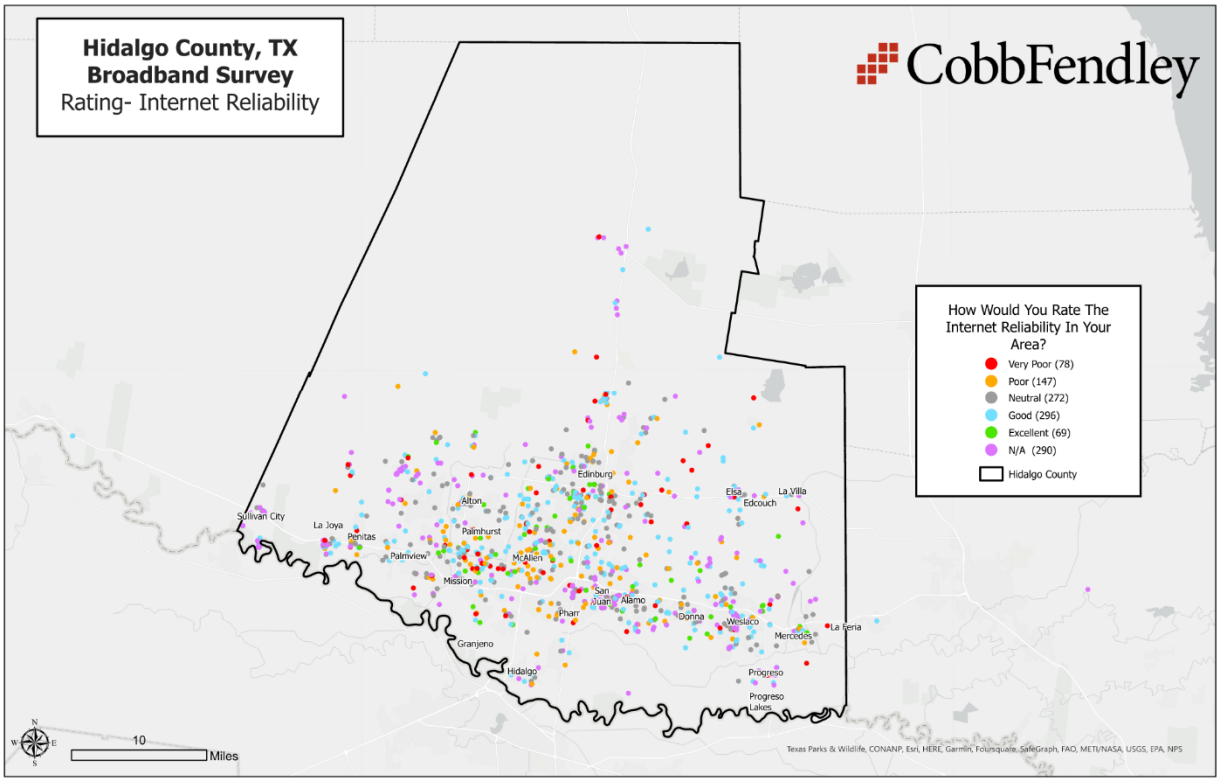

Figure 41: How Would You Rate Internet Reliability in Your Area?

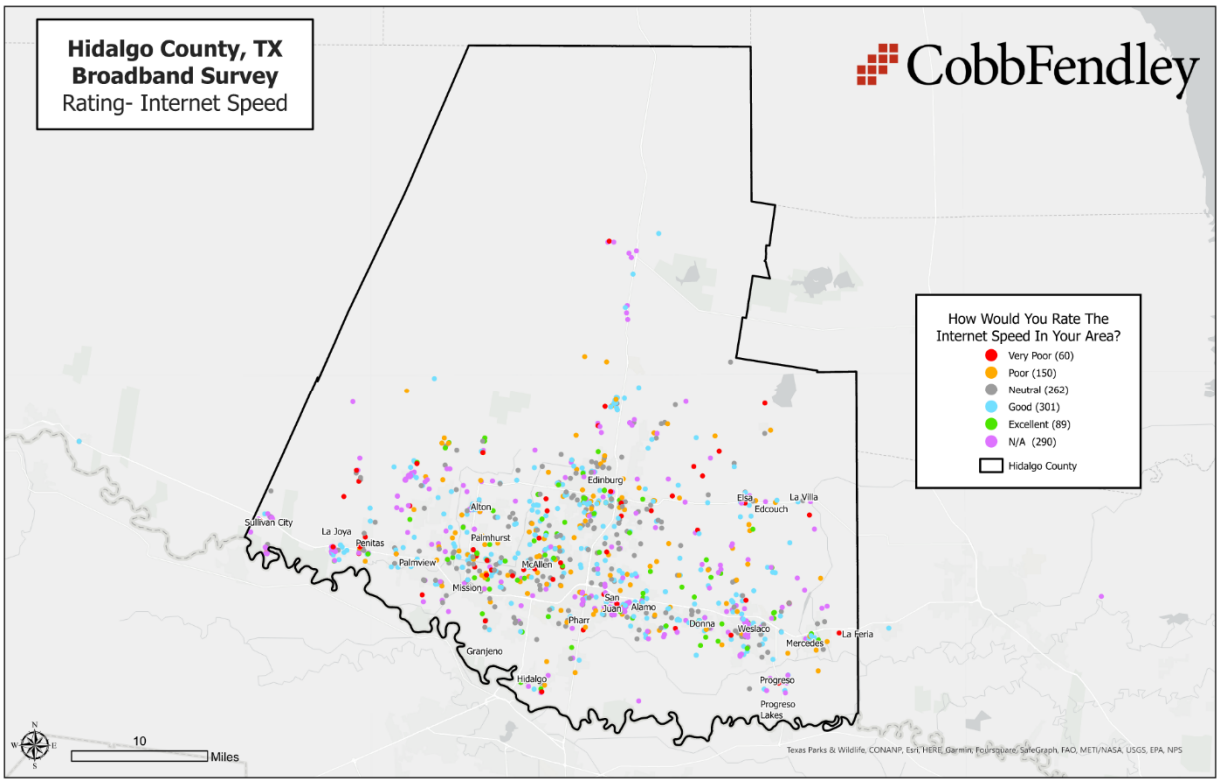

Figure 42: How Would You Rate Internet Speed in Your Area?

3.2.3 Speed Test Results

In addition to the survey administered throughout the community, a speed test was also provided for residents. Providing a speed test for this survey, or taking one in general, serves several purposes. A speed test enables one to gauge the performance of the purchased internet connection, ensuring the recipient receives the expected service from the ISP. Additionally, it aids in identifying potential issues, comparing speeds to the ISP's advertised rates, and troubleshooting problems that may arise. Regular speed tests help monitor the consistency of internet speeds, highlighting variations due to network congestion or other factors. All of which help the user potentially make informed decisions about one's internet service. Overall, compared to the survey results, approximately 71% of respondents completed a speed test (868 total).

Disclaimer: Speed Test Results

It should be noted that to get the most accurate speed test results, it's good practice to perform tests under various conditions, use multiple reputable speed test services, and consider testing at different times of the day to account for network variations. The provided speed test was hosted on the internal servers of speedtest.net from Ookla and embedded in the survey response platform. Responses were collected in the form of raw data, as well as manual input from the survey respondents within the survey process. The potential reasons why a speed test may not be accurate include network congestion, server distance, network load, hardware limitations, wi-fi interference, software or browser issues, ISP throttling, time of day, background processes, caching, VPN usage, network type, faulty equipment, geographical factors, and/or provider-side issues.

As both sources of data, raw and manual input, were collected, both will be presented in the following tables. Both sets of data had various stipulations that required adjustments, such as an ISP being hidden by iCloud Private Relay from an iPhone, or obvious human error entries that include speeds with more than five digits or multiple decimals. With these recognizable outliers removed, as well as results gathered from tests taken outside of the state of Texas and Hidalgo County, all remaining results are presented below.

Both Table 7 and Table 8 display the recorded internet service, the count of how many results were from that specific internet service, download speeds, upload speeds, and latency speeds. All speeds include both average and median to potentially remove outliers from the data. Table 7 represents a summary of the data collected from the manual input from within the survey and Table 8 displays the raw data collected by Ookla. The values within Table 7 will not match that of Table 8 due to some respondents not participating in the manual input of their collected data. As Ookla does not collect specific location data, the data within Figure 43 is from the collected survey responses, but only the responses in which the user specifically provided their address for this mapping purpose.

For context, optimal speeds for download and upload values would be higher than 100Mbps and 20Mbps, respectively. Otherwise, the speeds would be considered either Unserved or Underserved. Regarding latency, optimal speeds would be considered in the 20-40ms range, and anything quicker than (or less than) 20ms would be significant.

Response Totals:

- Table 7: Speed Test Results Based on Manual Input from Survey Responses
  - 584, with 45 responses removed due to unverified responses
- Table 8: Speed Test Results Based on Raw Data
  - 868, with 33 responses removed due to potential outliers
- Figure 43: Speed Test Survey Results
  - 679

Table 7: Speed Test Results Based on Manual Input from Survey Responses

Recorded ISP Name	Count of Responses	Average Download (Mbps)	Average Upload (Mbps)	Average Latency (ms)	Median Download (Mbps)	Median Upload (Mbps)	Median Latency (ms)
Spectrum/ Charter	440	184	32	37	111	12	30
AT&T	30	129	111	88	25	8	33
T-Mobile Home Internet	24	101	25	85	81	18	36
Other Responses	45	172	30	41	100	11	30

Table 8: Speed Test Results Based on Raw Data

Recorded ISP Name	Count of Responses	Average Download (Mbps)	Average Upload (Mbps)	Average Latency (ms)	Median Download (Mbps)	Median Upload (Mbps)	Median Latency (ms)
Spectrum	614	217	14	34	181	11	32
T-MOBILE USA	57	149	24	42	106	19	37
AT&T Internet	43	64	33	42	14	1	34
Spectrum Business	24	97	15	35	42	12	30
VERIZON WIRELESS	20	79	8	57	40	6	58
VTX Communications LLC	19	51	40	35	20	14	18
AT&T Wireless	14	32	6	49	27	5	45
VIASAT	13	11	3	658	3	3	652
SMARTCOM TELEPHONE, LLC	9	63	38	16	18	2	16
Comcast Cable	4	6	4	68	1	0	72
AT&T Services	3	81	81	37	52	14	25
Cogent Communications	3	110	33	38	93	27	52
Frontier Communications	3	161	141	8	143	67	8
TeamPharr.Net	3	471	308	6	489	328	6
Hughes Network Systems	2	6	2	668	6	2	668
STARLINK	2	31	8	46	31	8	46
Vexus	2	273	235	6	273	235	6

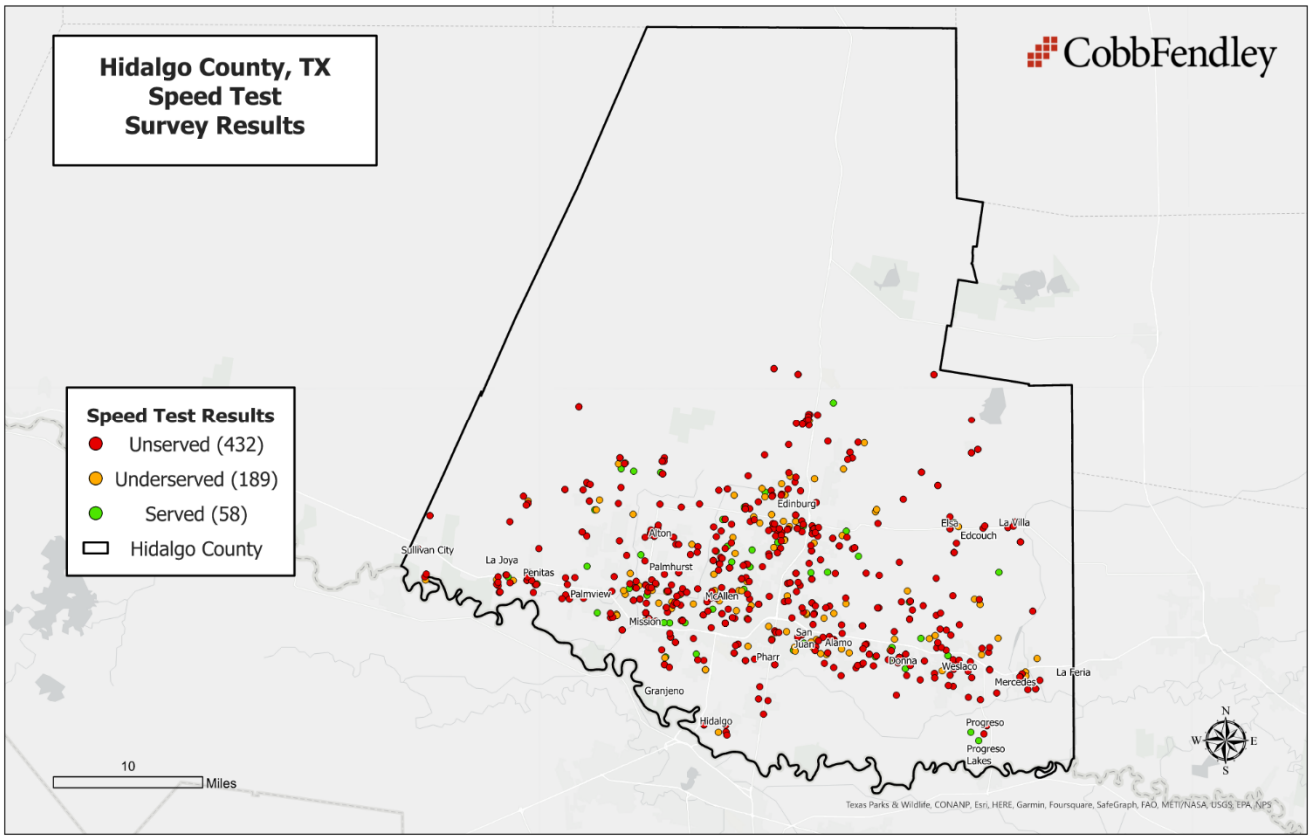

Figure 43: Speed Test Survey Results

Initially, the disparity in responses between total survey responses, raw speed test data, and manual user input speed test data from the survey needs addressing. 29% of those that took the survey did not take the speed test, and for those that did take the speed test only 65% of respondents input their data into the survey. That means a total of 690 respondents, or 56%, did not complete the survey as intended. While it would not be accurate to assume why that is the case, the act of clicking on a new link to run a speed test (which opens a new tab), performing the speed test, and then returning to the original internet tab with the survey to manually input the collected values may suggest that some level of digital illiteracy could be a potential cause for lack of speed test responses compared to survey responses.

Table 7 suggests that on average the main providers within Hidalgo County all provide a speed that would be considered served, but the median values indicate that this is not the case since none of them meet the speeds required to be labeled served. Additionally, for the responses in Table 8, five total providers provided an average of collected data that would be considered served. Out of those five providers, three provided a median of collected data that would be considered served. Comparing all data, exclusively for the responses in which the median speeds would be considered served, only a total of eight responses were collected (1%). In comparing these numbers to the map, no real trends based on location across the County can be determined. All served, unserved, and underserved results are shown as being collected from within city limits that are expected to contain fiber, cable, or fixed wireless options. And conversely, there are additional collected results outside of city limits that show as served, which is typically unexpected. However, there are still only 9% of these data points that show as served across the entire county. At this time, based only on speed test data, most of the collected and observed services cannot be viewed as future-proof.

4 NEEDS AND GAP ANALYSIS

To function efficiently, residents, businesses, schools, and local governments all depend on having an affordable, capable, and dependable communications infrastructure. Achieving this goal is not possible when relying on inconsistent coverage and pricing structures that lack competitiveness, and do not prioritize the quality of service (QoS) for the end user. The national attention on the concept and consequences of the digital divide has intensified, largely due to the impact of the COVID-19 pandemic.

Without a comprehensive understanding of the underlying causes behind the absence of infrastructure in specific regions or a deep comprehension of the digital divide's effects on communities, it becomes challenging to develop a meaningful solution that is tailored to address the broadband gap and meet the unique needs of the community.

4.1 Needs Determination

The existing condition of broadband infrastructure in the region and the extent of the digital equity gap can be substantiated through the research and data collection conducted as part of this study. In addition to analyzing public data related to accessibility, affordability, and adoption, three additional factors were also considered: community and stakeholder input, economic development considerations, and the capabilities of the network itself. All these elements will collectively help determine whether the primary need in Hidalgo County lies in enhancing infrastructure access, promoting greater adoption of existing networks, or a combination of both.

To ensure that Hidalgo County residents can receive the adequate service they deserve, the County is looking into various ownership and partnership models, including a fiber backbone and/or fiber to the home (FTTH). These decisions will be stakeholder-dependent, but the County is focused on ensuring a reliable service that can be offered to those living there. It should be noted that Hidalgo County has no interest in becoming an ISP.

4.2 Needs Discovered from Stakeholder Engagement

Hidalgo County was actively engaged in this process, relaying their known contacts, proposed demand points (facilities needing broadband service), preliminary research, and observations, all of which contribute to the understanding of the needs of the County which shape these future projects. Discussions with stakeholders addressed the goals for future projects, the state of the current broadband infrastructure footprint, the perceived service and application needs, the potential for future expansion, and any concerns or constraints that would help formulate recommendations. Engagements with local public entities focused on understanding their needs and gaps. In contrast, engagements with providers, operators, and other potential partners are directly involved in the planning and implementation process. The Stakeholder Engagement process took place over several weeks.

Through these conversations with Hidalgo County staff and stakeholder participation, the needs across the County could be established, these include:

- The Northern region of Hidalgo County, characterized by its rural demographics, exhibits an unequal level of network coverage when contrasted with the more densely populated urban Southern Central region.
- The Colonias Communities, predominantly situated in the Southern region of the county, similarly lack parity in coverage compared to the more urbanized Central areas.
- To facilitate the realization of achieving 100% broadband connectivity with future-ready solutions for all Hidalgo County residents, it is imperative to devise a long-term strategy for positively impacting rural residents through broadband infrastructure development.
- Strategies should be formulated to enhance broadband infrastructure not only for county facilities but also for public spaces, including libraries, recreational centers, and parks, with the aim of advancing connectivity and accessibility in these communal environments.

By engaging with stakeholders in local communities, the following excerpts capture areas of need within the County:

- Existing broadband options lack the requisite high-speed capabilities necessary to adequately serve public locations and County facilities.
- The Colonia areas within the County suffer from a pronounced deficit in broadband connectivity.
- The expansion and development of the County's northern region have heightened the demand for fresh and ample broadband capacity.
- The County needs improved internet services to support its new emergency management building.

In a comprehensive assessment, the primary requirement identified by all stakeholders throughout the County is a heightened level of reliability. Most of the County's enterprise internet needs are currently addressed through available wired options, including SmartCom, Foremost, and Spectrum.

From a residential perspective, although varying service tiers are accessible, the adequacy of these services largely depends on the user's geographical location. Following discussions with ISPs during stakeholder engagements, it has been discerned that there are expectations of network expansion within the County. These expansions are anticipated to bolster the telecommunications infrastructure accessible to residents of Hidalgo County. To offer further insights, data from previous sections, additional survey analyses, and input gathered from ISP stakeholders will be thoroughly examined and considered.

4.3 Evaluating the Determined Needs

While evaluating broadband access and infrastructure, it's essential to recognize that relying solely on FCC data, as a single isolated source, may be misleading. However, it does serve as a reference point for comparison when conducting more comprehensive research, considering current conditions and valuable insights gathered through meaningful stakeholder engagement. The approach taken for this Broadband Improvement Study initially involved gathering the latest publicly available broadband data as a foundational layer. This data served as a basis for further analysis, supplemented by additional layers of information, including the proposed network footprint and service requirements.

Numerous figures and maps in the subsequent sections of this report draw upon resources and data derived from various sources. These sources from FCC Form 477[8] data, American Community Survey (ACS) Survey data[9], USDA data for the urban and rural designation (also collected from the FCC Form 477 source) as well as survey and speed test data collected for this study. This information aids in identifying areas of need and informs whether issues primarily concern access or adoption.

As a reminder, it's worth revisiting that the FCC's current definition of "broadband" specifies internet speeds of at least 25/3 Mbps. However, this standard is considered outdated by many in the industry. Nevertheless, it is still employed by numerous programs to determine "Unserved" areas. Some agencies, such as NTIA, are reevaluating their "Underserved" classifications, which now include locations lacking access to 100/20 Mbps. The recommendation throughout this report, however, is for a symmetrical download and upload speed of 100 Mbps (100/100).

[8] Form 477 Resources. (2014, May 6). Federal Communications Commission. https://www.fcc.gov/economics-analytics/industry-analysis-division/form-477-resources
[9] Bureau, U. C. (n.d.). Available APIs. Census.gov. https://www.census.gov/data/developers/data-sets.html

Figure 46 identifies the census-based areas that are officially determined as urban and rural. In theory, one would typically find that urbanized areas with a higher population density are more likely to receive access to various offerings that rural residents may not due to the expected return on investment for businesses.

For example, more built out infrastructure on longer County roads that reach only a handful of homes does not make as much business sense as a high-rise apartment in a metropolis, especially where a Middle Mile or Last Mile may be more locally present. Those living in rural areas are likely experiencing other cost-burden factors, where lacking access to adequate broadband can compound socio-economic factors.

Before reviewing the remainder of the data, rural areas of the County will be initially assumed to be an access gap, for all intents and purposes. The information in the section Needs and Gaps Figures referred to throughout the following narrative can be found immediately below it. To assess potential access issues, we'll review the level of service and provider options available throughout the county. As shown in Figure 47, most of the County boasts multiple broadband providers, offering at least two or more options. However, it's important to note that this data, as mentioned previously, is known to be misleading. Additionally, this data encompasses satellite options, which, while is a technical solution for those in need, is not a future-proof technology like fiber-optic connections.

Common barriers to adoption often include factors like customer age, limited provider choices, subpar customer service, income constraints, and digital literacy. Access to options plays a significant role in this, which means not only having physical network infrastructure available at homes or businesses but also having devices capable of utilizing this technology. Figure 48 displays census tracts with percentages of residents lacking smart devices, such as computers, smartphones, or tablets, needed to fully utilize broadband services. These percentages vary, with some communities showing as low as 5% of households and others as high as 48% lacking smart devices. Notable communities with device access challenges include the La Joya, Hidalgo, and Granjeno areas.

Figure 49 illustrates the proportion of households lacking internet connectivity. This encompasses various residential structures such as houses, apartments, and mobile homes, including housing units where neither paid nor free internet services can be accessed or utilized by residents. This suggests the presence of a digital divide within the rural communities where the lack of access is noticeably higher. If adequate internet access is absent, it's unlikely that individuals will invest in devices and equipment that cannot fulfill their desired digital needs where a digital divide may further be increased.

When analyzing median household income within a community, it's beneficial to consider household size as well. Larger households may have less disposable income compared to single individuals or childless couples. In Figure 50, it's evident that a majority of rural census areas align with or fall below the county-wide median income of $44,666. Most of the county's census areas, however, hover around the median income level.

Incorporating household size as an additional layer reveals that most of the county's households have approximately three or more members, with the county-wide average being 3.4. Typically, a household size of two indicates either young adults or retired couples. Figure 51 provides further insights, as age can be a factor indicating digital literacy needs or resistance to technology adoption.

Surprisingly, the macro view of these assumptions proves inaccurate, with most areas having a population within the 21-40-year-old range. The percentage of persons over 65 years old in Hidalgo County, based on US Census data, is close to 11.5% across the county.

Finally, to validate the survey data collected, the cost per month spent on internet services relative to the number of people in households is examined using the internet in Table 9. The majority of respondents pay between $76 and $100 per month (40%), and approximately 61% of households have at least three individuals using the internet.

Table 9: Cost Per Month Based on Number of Residents In a Household

Internet Cost Per Month ($)	Number Of People In The Household Using The Internet			
	1-2	3-5	6+	Total
0-25	11	15	3	**29**
26-50	41	55	12	**108**
51-75	71	136	17	**224**
76-100	102	230	34	**366**
101-125	20	64	14	**98**
126+	15	53	15	**83**
Total	**260**	**553**	**95**	**908**

The size of households throughout the County is similar to the response from the survey, but an important factor to note is that the respondents in homes with two persons using the internet may correlate with that of the median age and its rurality. An example of this could be a married couple whose kids are just graduating high-school and move out for college, or two young adults living together as roommates. Many adults choose to not make any changes to their internet plans for fear that this might increase their monthly fee, when in reality they are now eligible for a much less costly plan.

In households of two or less:

- 27% pay less than $75 per month
- 39% pay $76+ per month

In households of three or more:

- 25% pay less than $75 per month
- 42% pay $76+ per month

There could be many reasons why households of three or more are paying more for internet, that includes access to network infrastructure costing more in rural areas or maybe paying for a higher speed threshold to accommodate more people in the household. The latter reason could potentially be tied to digital literacy if a consumer doesn't understand the internet impact on users, devices, and speeds.

Based on HighSpeedInternet.com[10] the following provides a summarized background for internet speeds needed for various devices and users:

- 0-5 Mbps
  - Checking email, streaming music on one device, searching on Google
  - 1-2 people
- 40-100 Mbps
  - Streaming HD video on a few devices, multiplayer online gaming, downloading large files
  - 5-7 people
- 500–1,000+ Mbps
  - All of the above, but on multiple devices of the highest of qualities
  - 10+ people

[10] What Is a Good Internet Speed? (n.d.). HighSpeedInternet.com. https://www.highspeedinternet.com/how-much-internet-speed-do-i-need#:~:text=A%20good%20download%20speed%20is

4.4 The Determined Needs for Broadband in Hidalgo County

Based on the comprehensive data presented in this and the previous sections, the key factors indicating areas of need, whether related to access or adoption would be:

- Adequate Services at Affordable Prices
    - The majority of Hidalgo County residents pay more than $50 per month for their internet service, with nearly 40% paying $75 per month or more. The speed test data, though not entirely reliable, reveals a significant number of responses that do not meet the 100/20 Mbps threshold, as indicated by both the spatial results map and the presented median values. Many residents are paying a premium for internet services that do not meet the future requirement of symmetrical speeds.
- Access to Smart Devices
    - The population that does not own a smart device varies across the County, but in certain communities like Edinburg, Elsa, Mercedes, and La Feria the percentage of households without a smart device can be upwards of 15 to 25 percent. There are various factors, ranging from trust in an ISP to offers of adequate service to total cost that lead to a consumer not purchasing a device or subscribing to the internet. Those factors need to be addressed, where applicable by the providers, but the longer an individual goes without internet the further removed they become from modern technologies.
- Upgraded Infrastructure in Various Rural Areas
    - Sullivan City, La Joya, Progreso, La Feria, and all the Northern portion of the County present the greatest need for updated infrastructure in the County.
    - Although all Colonias share a need for improved internet access, specific regions have been targeted through engagement with stakeholders. These areas include: Colonias North of Mercedes, a Colonia “row” west of HWY 107 and Conway Rd. in Mission/Alton TX, La Union del Pueblo Entero in San Juan, ARISE in Alton, the TX A&M Colonias program nutrition center, and the various County Colonia self-help centers.
- Digital Literacy
    - Digital literacy is a complex and multifaceted concept influenced by many factors discussed in this report. Quantifying digital literacy comprehensively is challenging, but it is crucial to recognize that communities facing digital literacy challenges will experience an exponential divide as technology evolves rapidly. While cost and rurality are the predominant factors hindering adoption in Hidalgo County at present, it's important to acknowledge that digital literacy may not be the primary barrier to adoption today, but it is likely to become increasingly relevant in the future. As technology advances, communities struggling with digital literacy will face greater hurdles in adopting broadband services.
- Workforce Development
    - Hidalgo County, home to many higher education institutions and trade schools, produces a large pool of skilled workers and professionals, but is challenged with retaining this workforce as large companies and industries have established their offices near major business, technology, and healthcare hubs. These cities and hubs have robust broadband service offerings which are crucial to companies that rely heavily on internet accessibility, resiliency, and redundancy to keep operations moving.

The needs listed previously are represented in Figure 44. These areas of need are from the responses of community leaders through the stakeholder engagement process, analyzing determined needs, demand points in the County and the necessity of a redundant network to provide additional context to overall County-based needs.

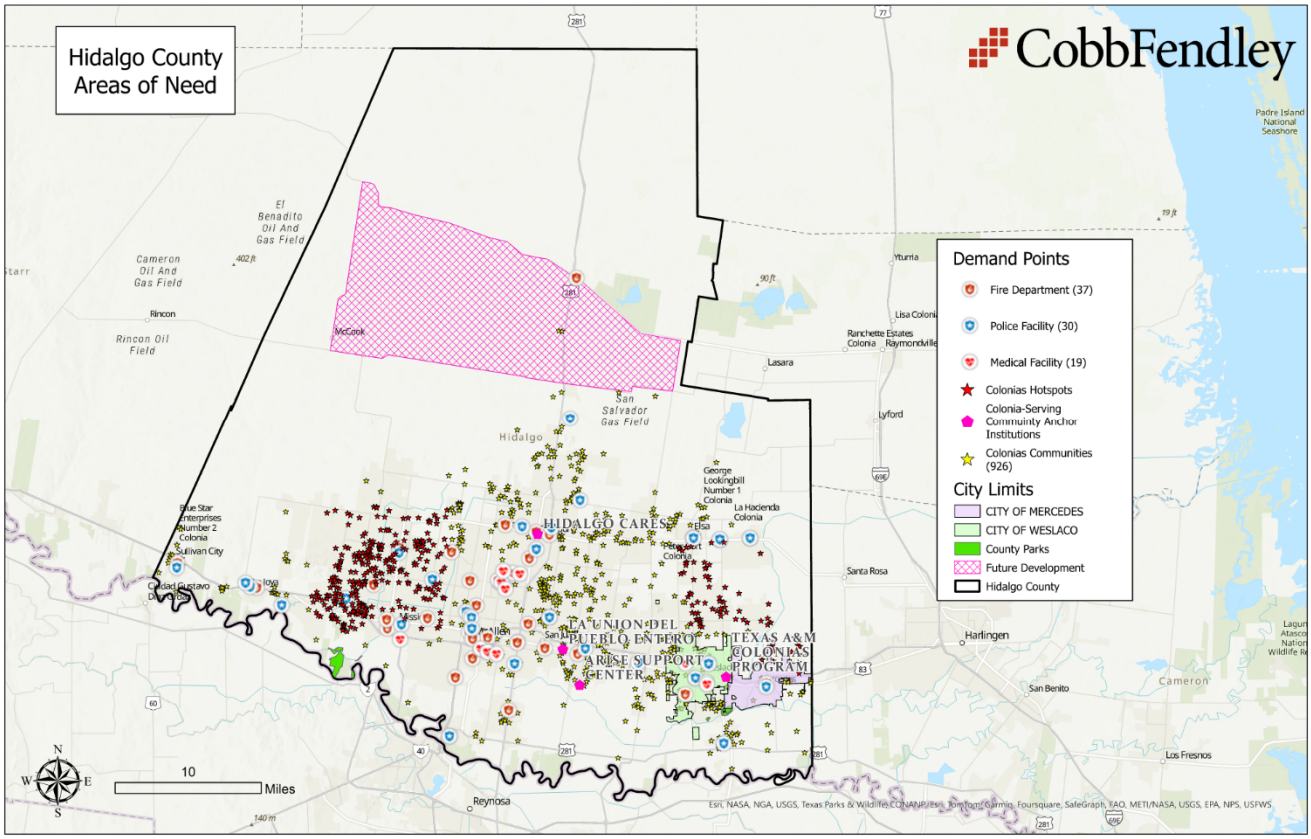

Figure 44: Hidalgo County Areas of Need

4.5 Additional Notes on Emergency Management, Workforce Development, and Other Considerations

Most of the focus has been on residential access to internet, but other important factors, such as emergency management, are also a necessary consideration for broadband access. Emergency management, especially regarding security functions and healthcare, typically requires secure and dedicated channels that do not share bandwidth within the network. Emergency management facilities, healthcare facilities, public safety facilities, County facilities, and hospitals benefit from local connectivity while also ensuring the security and integrity of sensitive data that may stay local within the network or go into VPN-based (Virtual Private Network) cloud charting systems, patient databases, etc. Depending on how advanced a hospital and its specialty are, there can be a broad range of content of varying sizes from text charting to high-resolution scans and videos for surgical documentation.

Healthcare facilities within this region need to have the network capacity to expand and take advantage of bandwidth-heavy applications to stay competitive and provide the best care for the local populace. Wireless facilities play a large role in connecting mobile devices for emergency services such as fire and police. These wireless facilities can be more reliable when they have fiber backhaul connections to central facilities where they can manage connections to an array of applicable databases. Having interconnectivity between emergency service facilities would significantly increase the effectiveness of law enforcement and emergency response by consolidating network assets and removing costly leased lines.

In Hidalgo County, the flight of skilled workers and professionals to areas near major business, technology, and healthcare hubs is intrinsically linked to the critical role that broadband infrastructure plays in the modern business landscape. Broadband accessibility is the cornerstone of contemporary industries, facilitating seamless communication, data exchange, and remote work. It ensures operational resiliency and redundancy, crucial for uninterrupted business continuity. Large companies and industries gravitate towards regions with established broadband infrastructure to reap these benefits, making workforce development increasingly essential.

To address this challenge, Hidalgo County must invest in expanding and enhancing its broadband capabilities, ultimately making it an attractive hub for businesses. By doing so, the County can foster workforce development, retaining its pool of skilled professionals and workers who will have access to the essential broadband infrastructure that modern businesses demand. Investments in education and training programs that align with the evolving technological landscape will enhance the County's appeal to businesses, further solidifying its position as a burgeoning economic center.

4.6 Needs and Gaps Figures

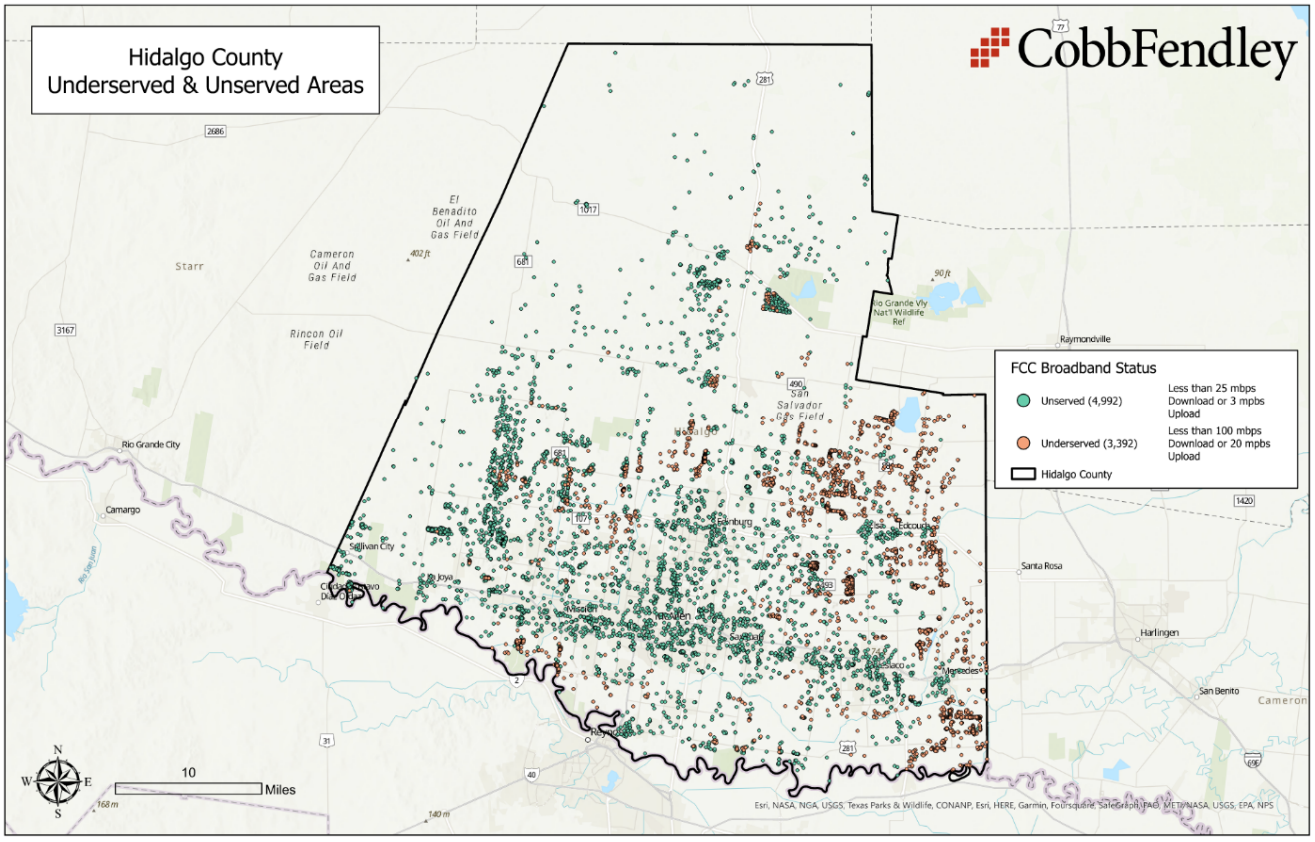

Figure 45: Unserved and Underserved Areas in Hidalgo County

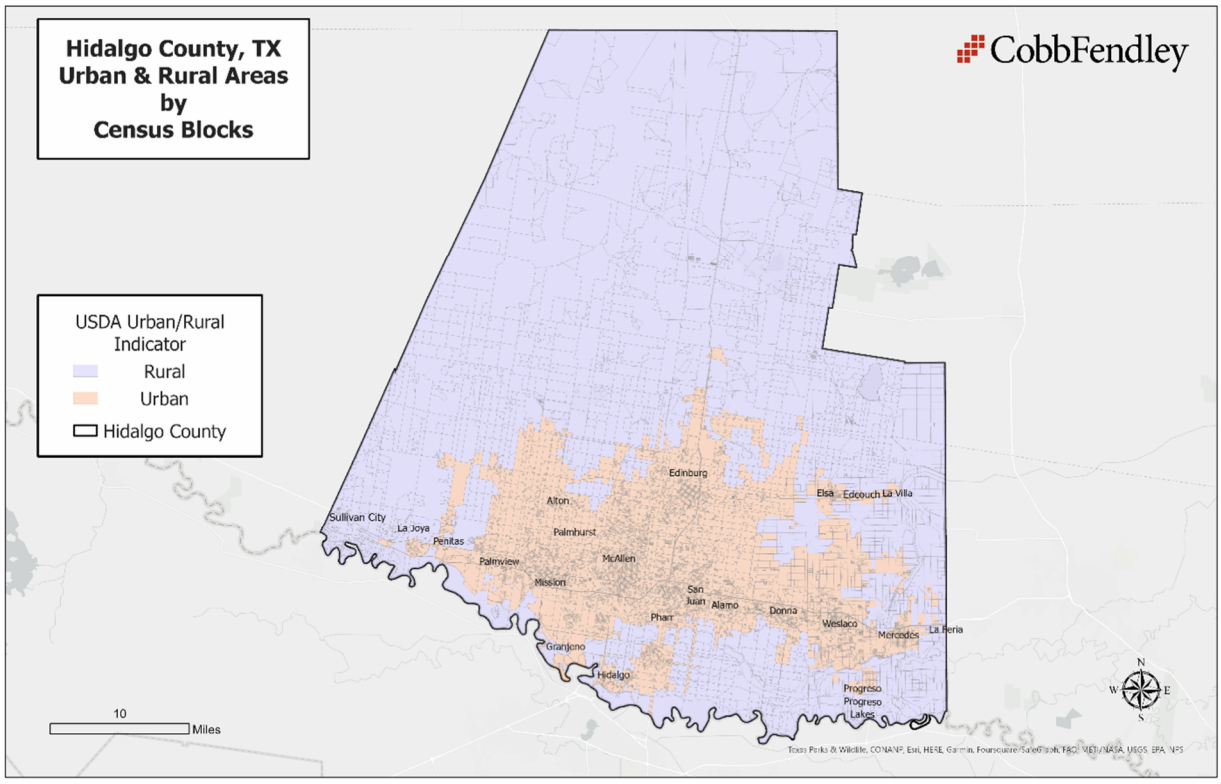

Figure 46: Urban & Rural Areas in Hidalgo County

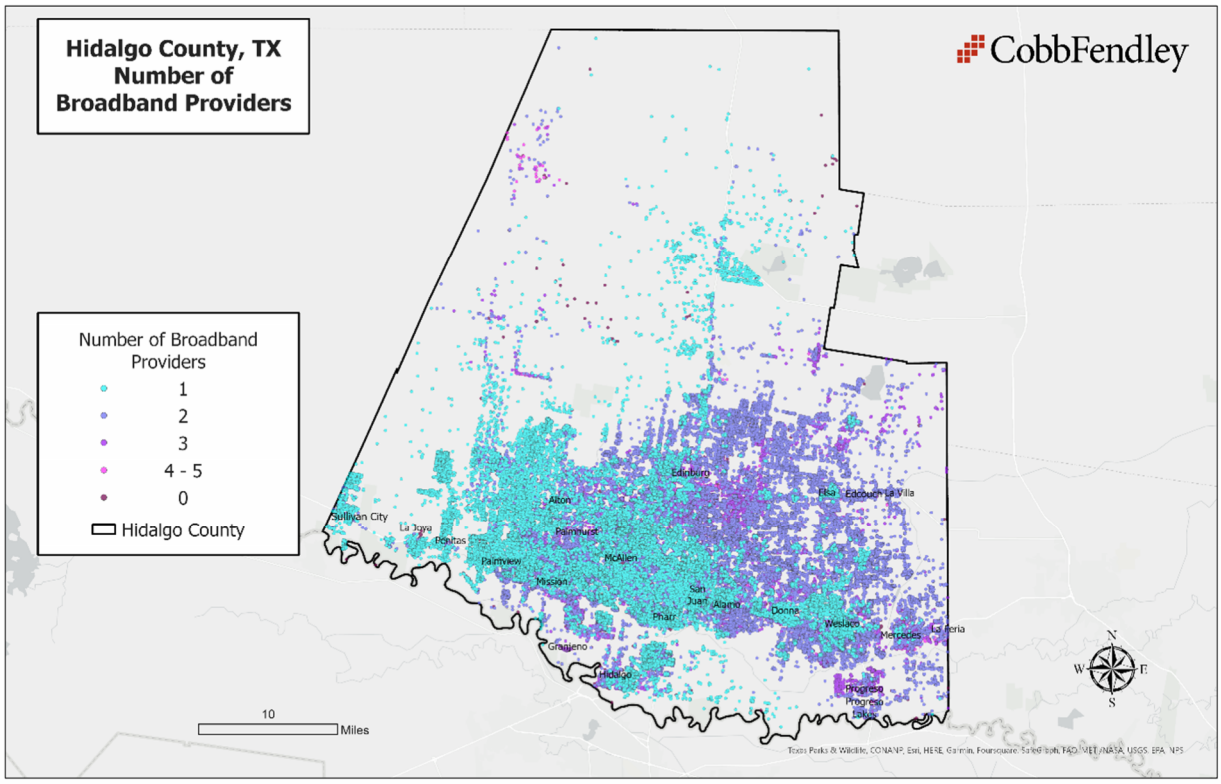

Figure 47: Number of Broadband Providers

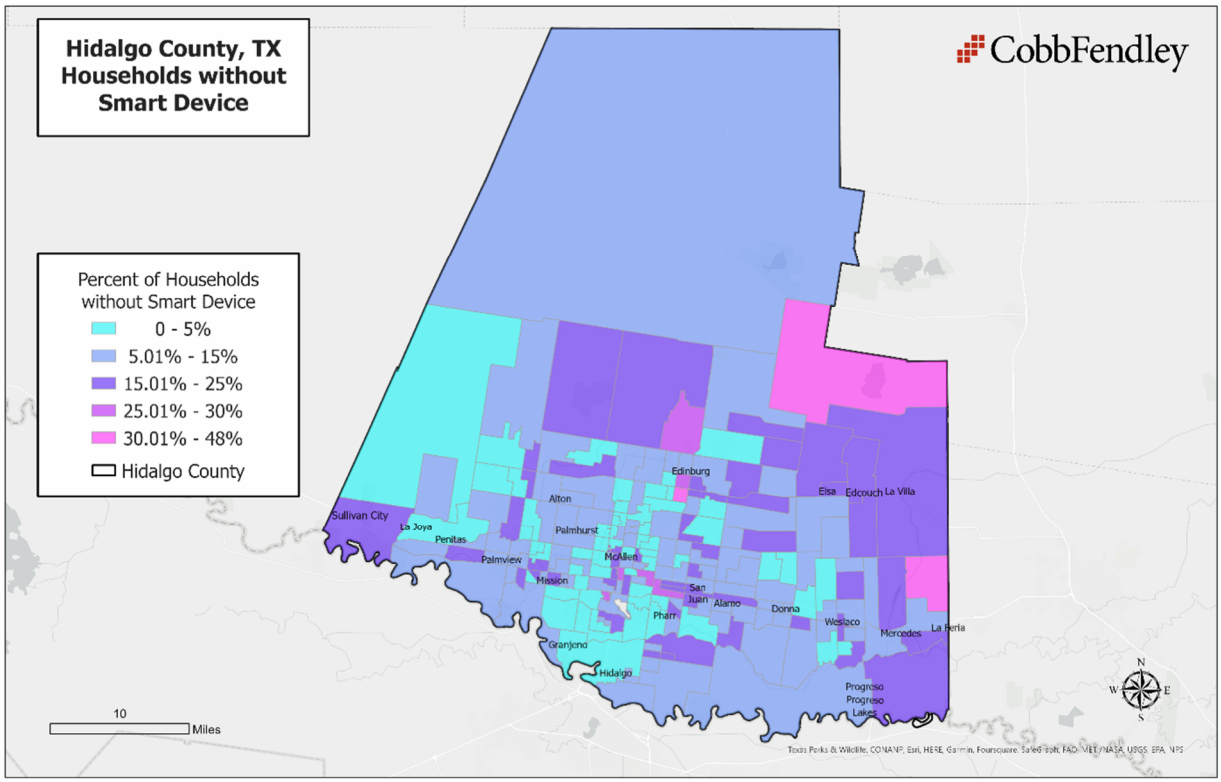

Figure 48: Percent of Households Without Smart Devices

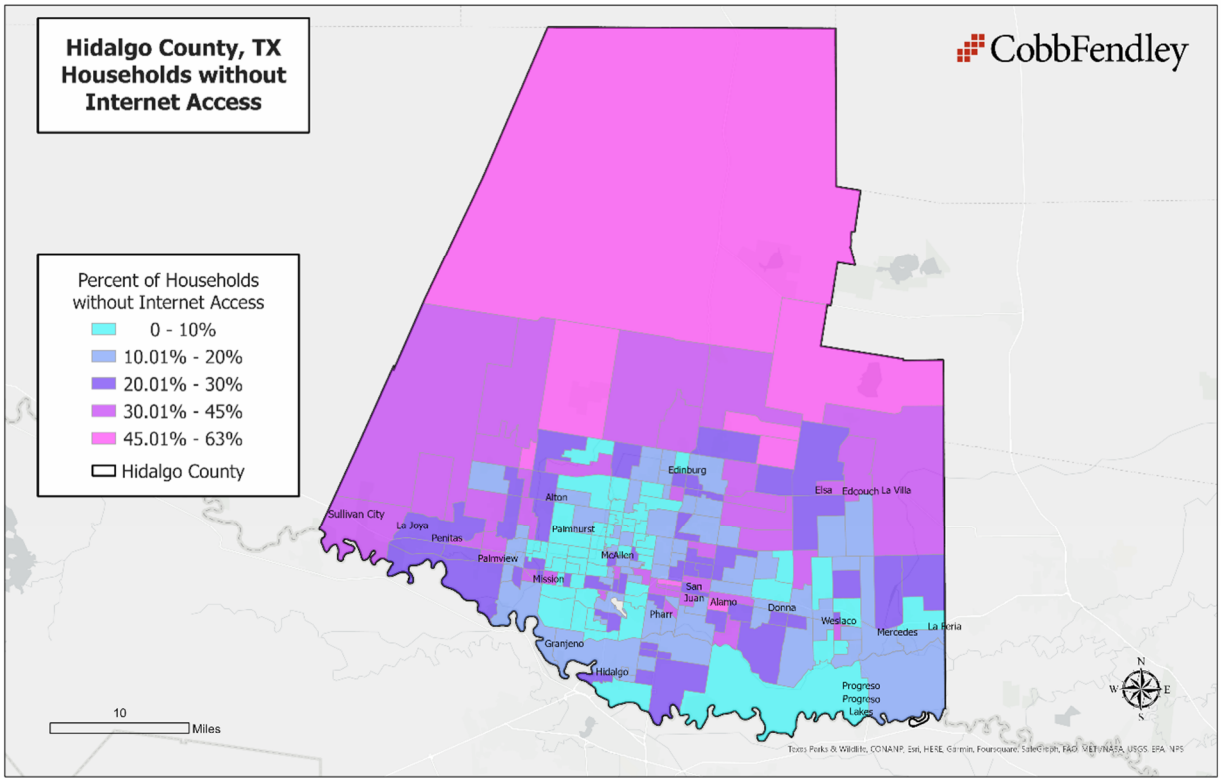

Figure 49: Percent of Households Without Internet Access

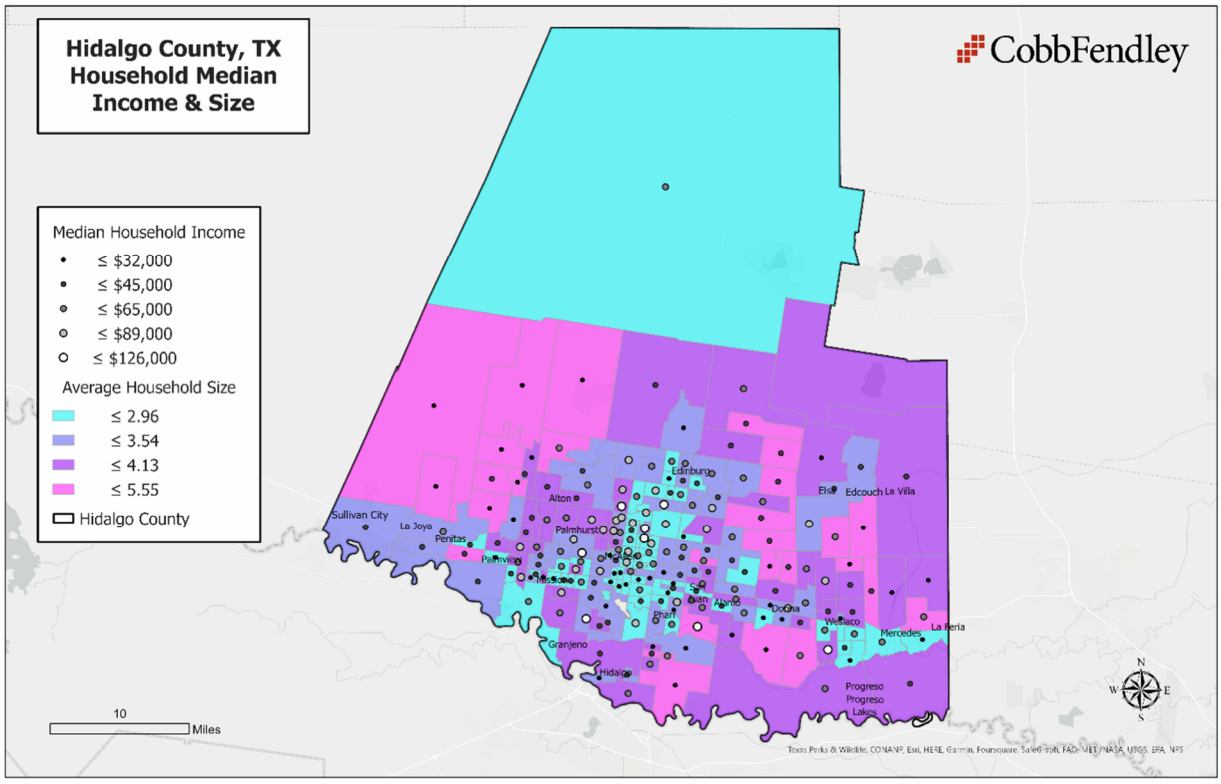

Figure 50: Average Household Size and Household Median Income

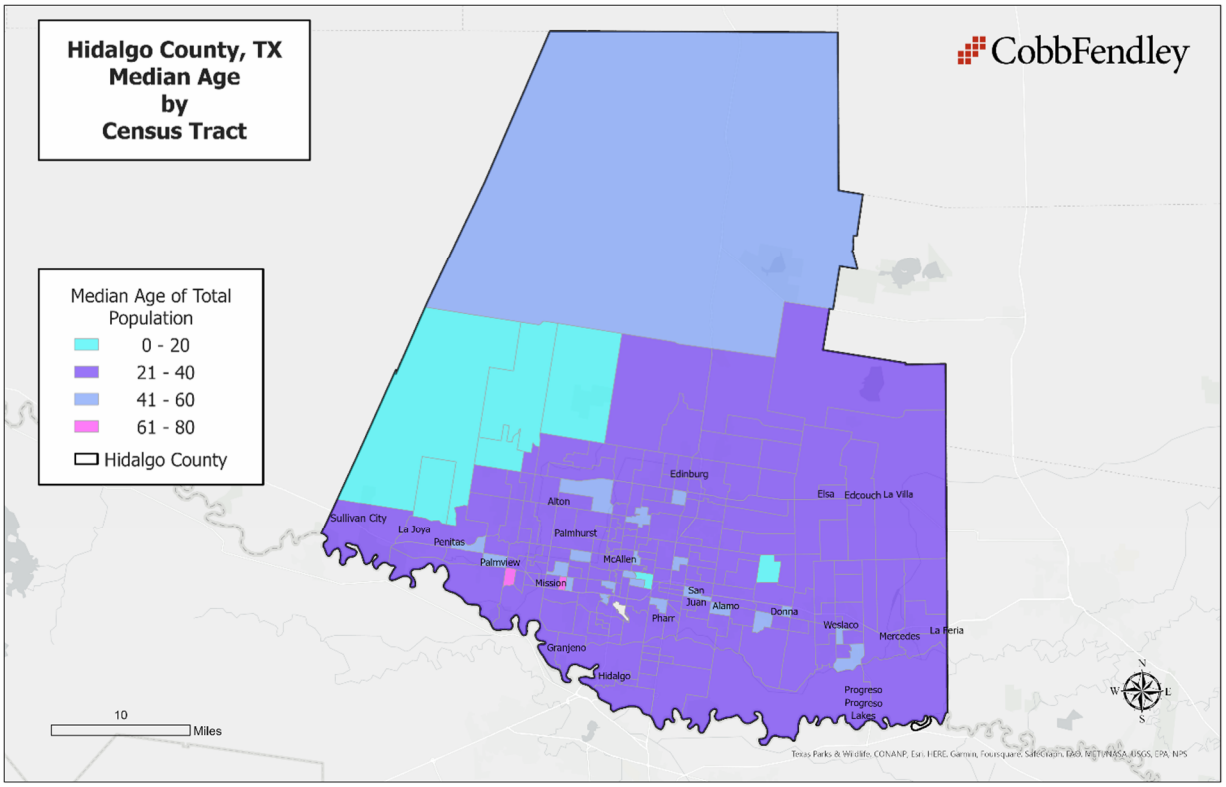

Figure 51: Median Age of Hidalgo County Residents

5 NETWORK DESIGN PLAN

5.1 High-Level Design

The High-Level Design (HLD) serves as a visual representation of the necessary broadband infrastructure footprint required to address the needs and gaps as explored in prior sections. The primary goal of proposing network infrastructure and solutions remains to provide adequate high-speed internet access through broadband network implementation, accounting for the connectivity of the County assets and local partners with goals for broadband infrastructure expansion for underserved, marginalized, and adversely affected groups within the County. The development of this HLD requires first understanding factors which dictate network design criteria and bringing these in as visual overlays onto the map of Hidalgo County.

Beginning with defining the various boundaries, the Hidalgo County line was the primary extent during design and analysis. Next, additional spatial data is overlayed within the boundary to highlight identified demand points and determine areas of need within the established focus area. Through conversations with the County, stakeholder engagement with public entities and various communities, demand points were identified as lacking the necessary broadband services to effectively serve their communities and these locations were added to the map. Market research layers, such as Unserved (25/3 Mbps) and Underserved (100/20 Mbps) communities were also overlayed and contrasted with public and other stakeholder feedback to develop a proposed network infrastructure footprint for the initiative.

Finally, existing assets such as private sector network fiber and towers, as well as any public network infrastructure, were overlayed as a reference, before adding any proposed facilities as part of the HLD. As partnership is a potential focus to moving forward with implementation, understanding where infrastructure exists was necessary in determining where the gaps in coverage currently are located throughout the County. Please note that many of these partner-based layers were reviewed internally and cannot be used on public map displays.

Many other factors were researched, and reference layers were developed and reviewed which provided additional perspective to the existing network landscape and geographical barriers, such as drainage channels and railroads. These reference layers help visualize cause and effect in terms of lack of connectivity in hard-to-reach areas, and shape routing design to minimize costly crucial crossings, while still providing Middle Mile access. Having completed this background research, data accumulation, and overlay of mapped products set the stage for a considerate and deliberate HLD where all relevant factors are present and informing in design decisions.

It should be noted that routing for a HLD does not include detailed alignments at the street level, with considerations for the right of way, easements, existing utilities, permitting design requirements, or final construction methodology. Routing at the high level does allow for providing an overall order or magnitude and is the foundation for a successful Low Level Design and engineering. The HLD, as represented in Figure 52 and shown overlapping with underserved or unserved addresses in Figure 53, consists of the priority elements in creating a greenfield Middle Mile network design.

A “greenfield” approach does not consider service provider or other existing infrastructure, and therefore includes a design created from scratch with County needs as priority. This design method offers a unique opportunity to optimize and tailor the infrastructure and systems to meet specific needs and incorporate the latest sustainable and efficient technologies. A greenfield design will allow for efficient land use, reduced environmental impact, and the implementation of energy-efficient solutions, ultimately leading to lower operational costs, reduced resource consumption, and a smaller carbon footprint. This approach also minimizes the challenges associated with retrofitting existing infrastructure, providing greater flexibility and long-term sustainability in various sectors, from urban planning to technology deployment. Creating the HLD in this method allows for the County to understand their needs from a macro point of view and allows various providers to potentially adapt their existing networks to meet this overall demand in multiple pieces or projects.

For this greenfield design, the primary factors taken into consideration were the areas of need and the need for redundancy. More details of the infrastructure components which together make up a proposed Middle Mile network throughout the County will be presented in the following subsections. However, it is important to note that this is not the recommendation within this study, as there is an abundance of existing fiber already present throughout Hidalgo County. It is, however, the start of a greenfield proposed Middle Mile route that analyzes the current areas of need with an attempt to reach as many residents as possible based on current needs and future demands. This greenfield idea, with the addition of existing infrastructure, will be expanded upon to introduce Figure 54, a more accurately proposed fiber footprint.

Based on collected public data and research, the black lines in Figure 54 represent a potential layout of likely fiber within Hidalgo County. Using this information, as well as the greenfield HLD design, a true representation of what could be proposed to fill the areas of need can be seen through the various colored lines representing different fiber sizes, provided within the previous map.

While a partnership (or multiple partnerships) to fill needs throughout the County is a likely scenario in expanding high-speed internet coverage, it is not likely that all these represented existing infrastructure lines could be used. This map should be used, however, in a manner that indicates the importance of public private partnerships in a region with multiple infrastructure owners. While nearly 400 miles of proposed greenfield design could help reach all the perceived areas of need throughout the County, with the potential of partnerships included that greatly reduces this proposed fiber quantity to about 65 miles, a near 83% difference.

The proposed footprint within this map also suggests that redundancy is a need throughout rural Hidalgo County. As communities expand outside of the main cities, a reliable internet connection is vital to the success of the network. For additional context, redundancy is crucial in fiber route design to ensure network reliability and minimize downtime. By establishing multiple diverse routes for the fiber optic network, you create backup pathways that can be used in the event of a fiber cut, equipment failure, or other disruptions. Redundancy helps maintain uninterrupted service, reduces the risk of data loss, and enhances network resilience. It's especially important for critical applications, such as data centers, telecommunication networks, and emergency services, where downtime can have significant financial, operational, or safety consequences.

5.2 High-Level Design for a County-Wide Network

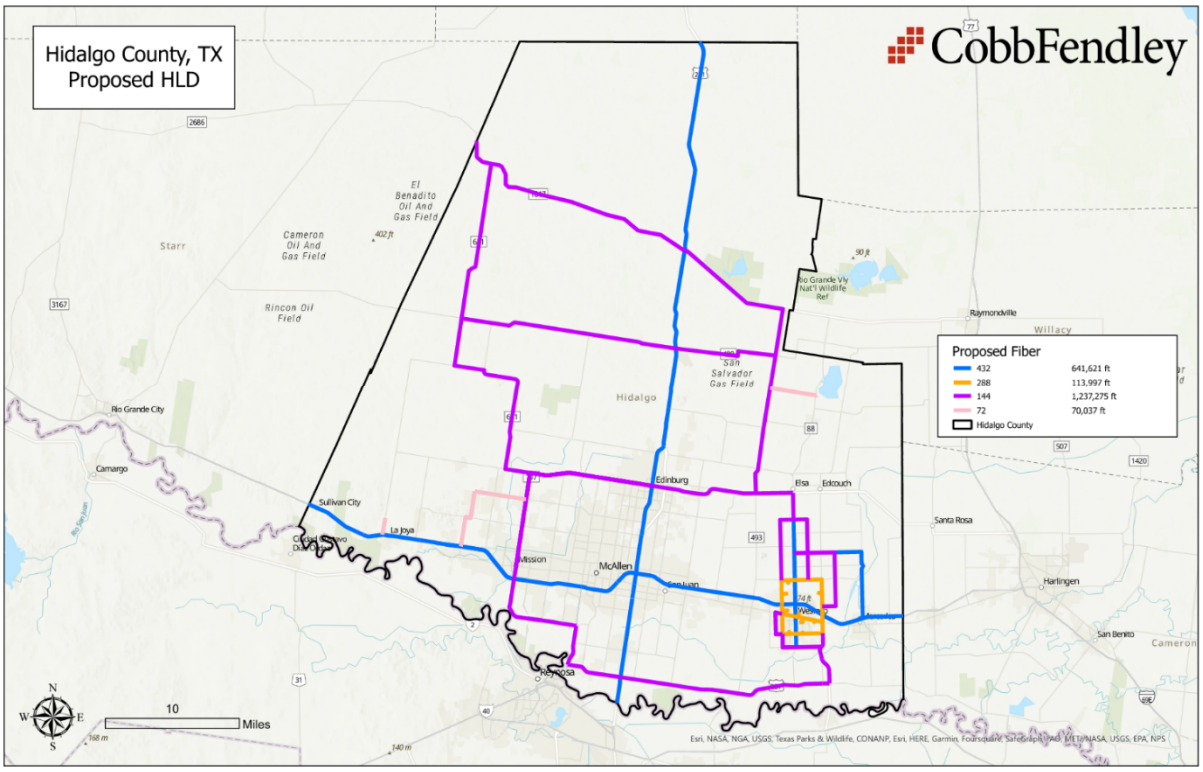

Figure 52: Hidalgo County Middle Mile HLD

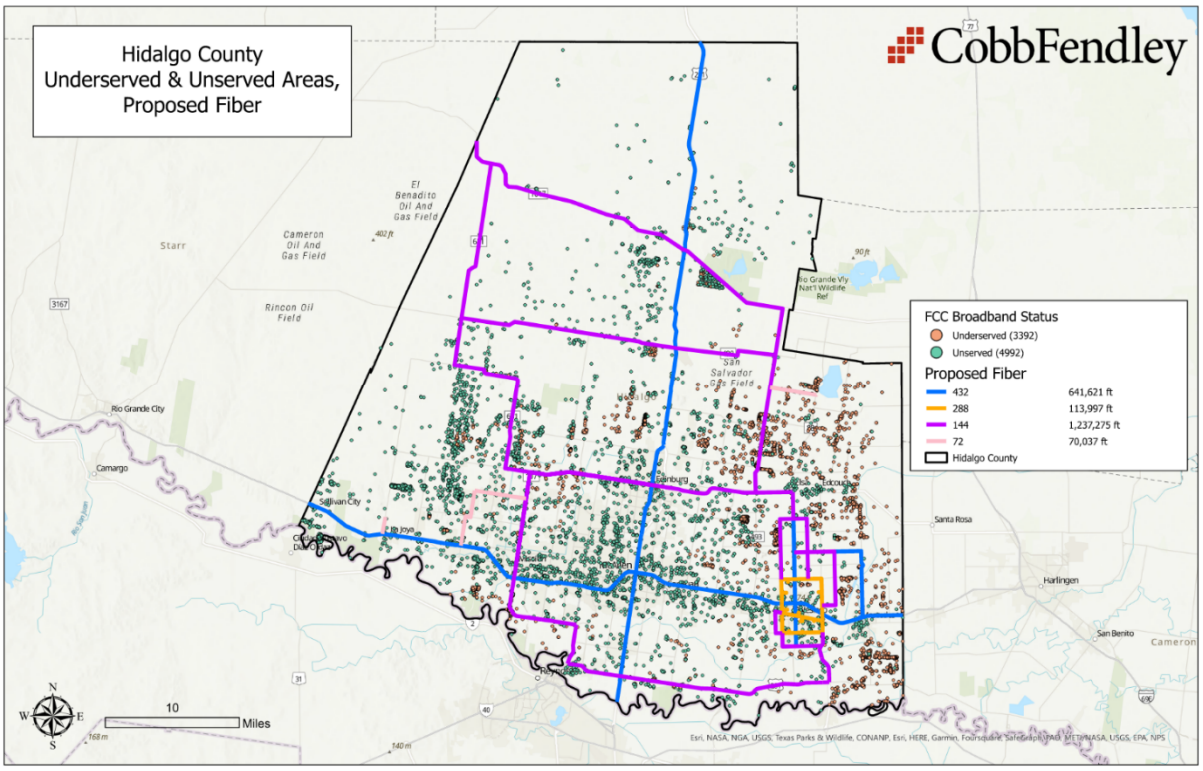

Figure 53: Middle Mile HLD Overlayed with Underserved or Unserved Addresses

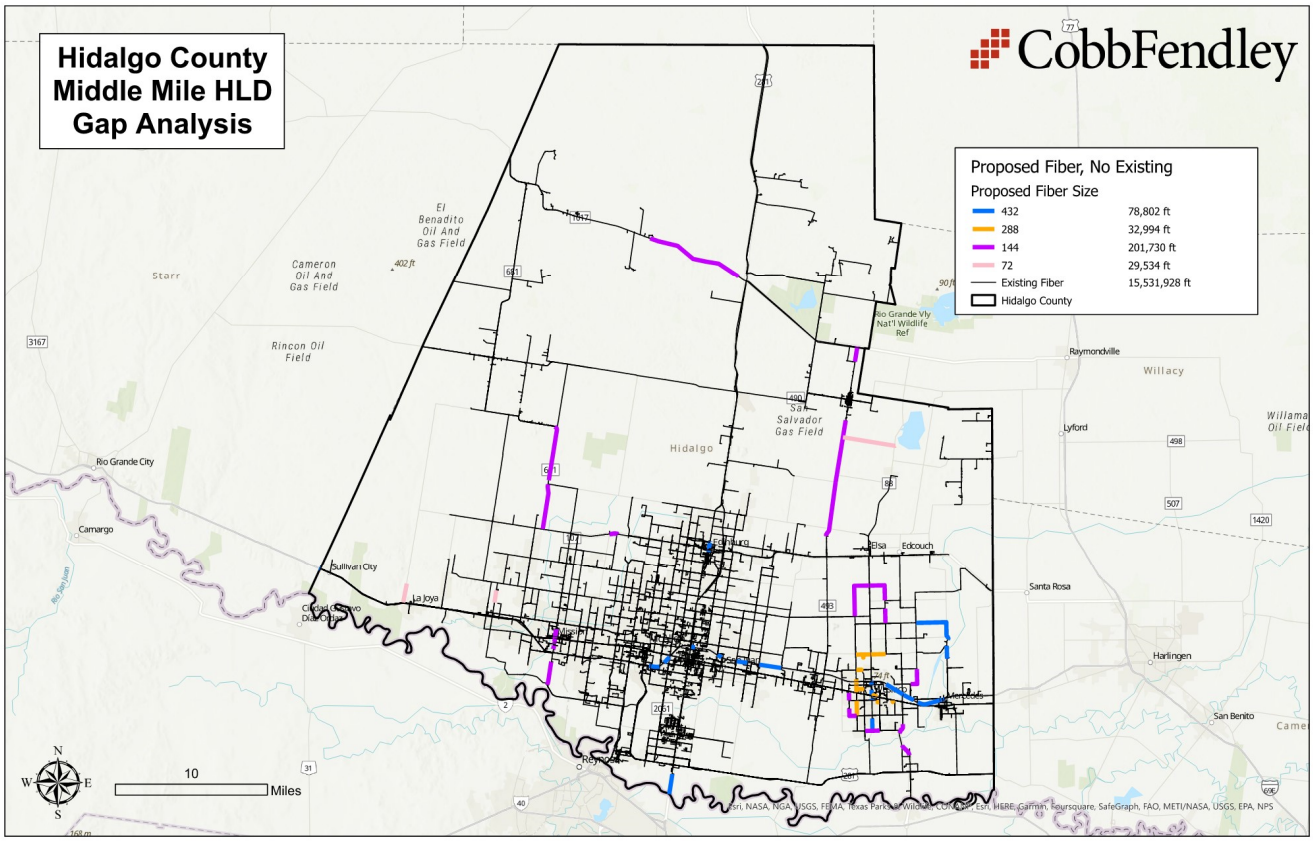

Figure 54: Hidalgo County HLD Gap Analysis

5.2.1 Areas of Need and Various Demand Points

To successfully finalize the routing of a Middle Mile network design spanning the entire county, it was crucial to gain a spatial understanding of the geographical extent of requirements across the region and identify specific locations in need of connectivity. The NEEDS AND GAP ANALYSIS section within this report serves the purpose of identifying underserved communities, potentially underrepresented by federal data, which lack sufficient network coverage. These unmet needs form a foundational component of the HLD. Figure 55 provides a visual representation of the federally designated areas with residents who are either unserved or underserved.

Creating an Areas of Need map entails a comprehensive analysis integrating data from various sources. Beginning with the residential survey, additional factors were included starting with vital insights into population distribution, density, and community-specific needs. Anticipated future development patterns are also considered to anticipate potential growth and their impacts on the region. Special attention is given to Colonias, understanding their unique challenges and requirements. Additionally, demand points such as fire departments, police facilities, and medical centers are carefully mapped to pinpoint critical areas requiring enhanced infrastructure and services. By collating this diverse data, Figure 56 offers a strategic visual representation of essential areas that need focused attention for better resource allocation and planning.

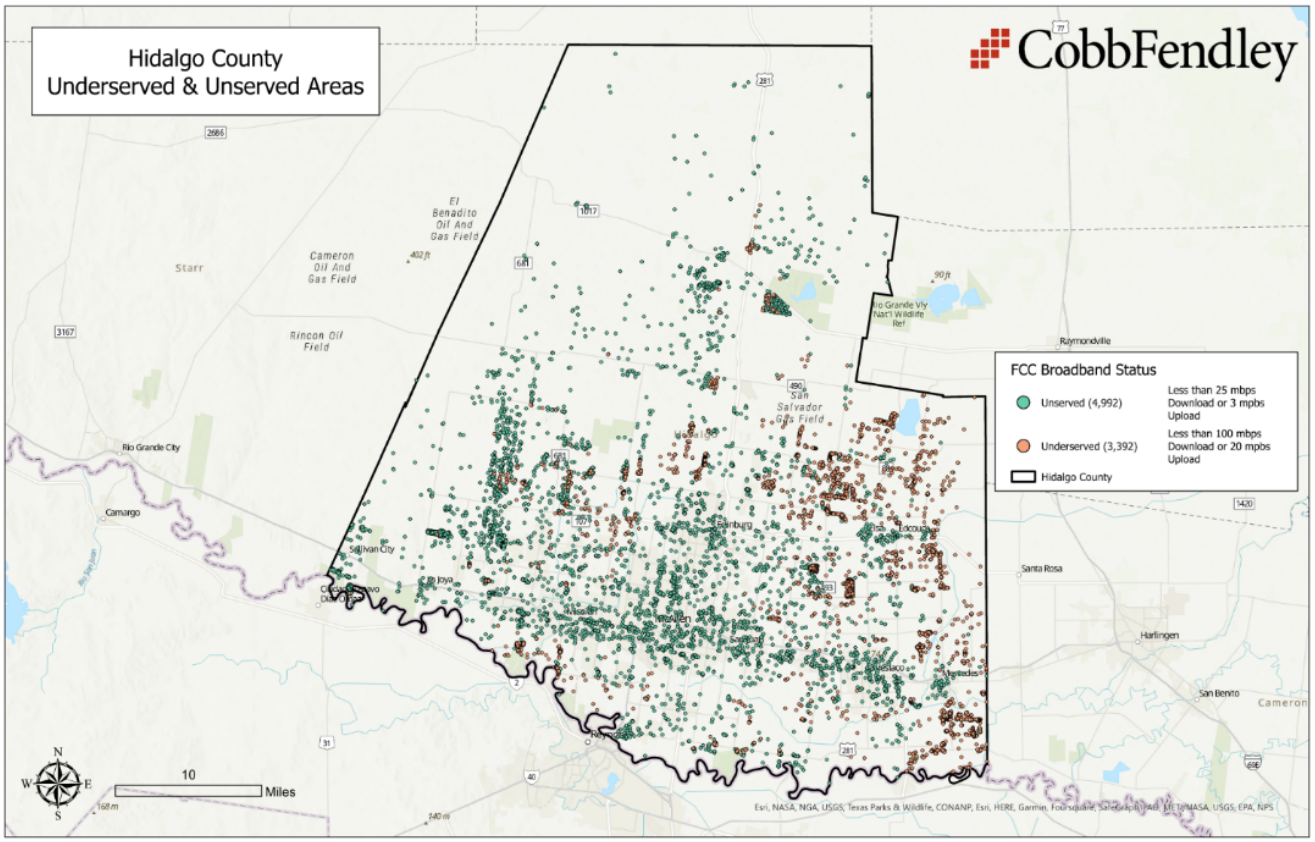

Figure 55: Unserved and Underserved Areas in Hidalgo County

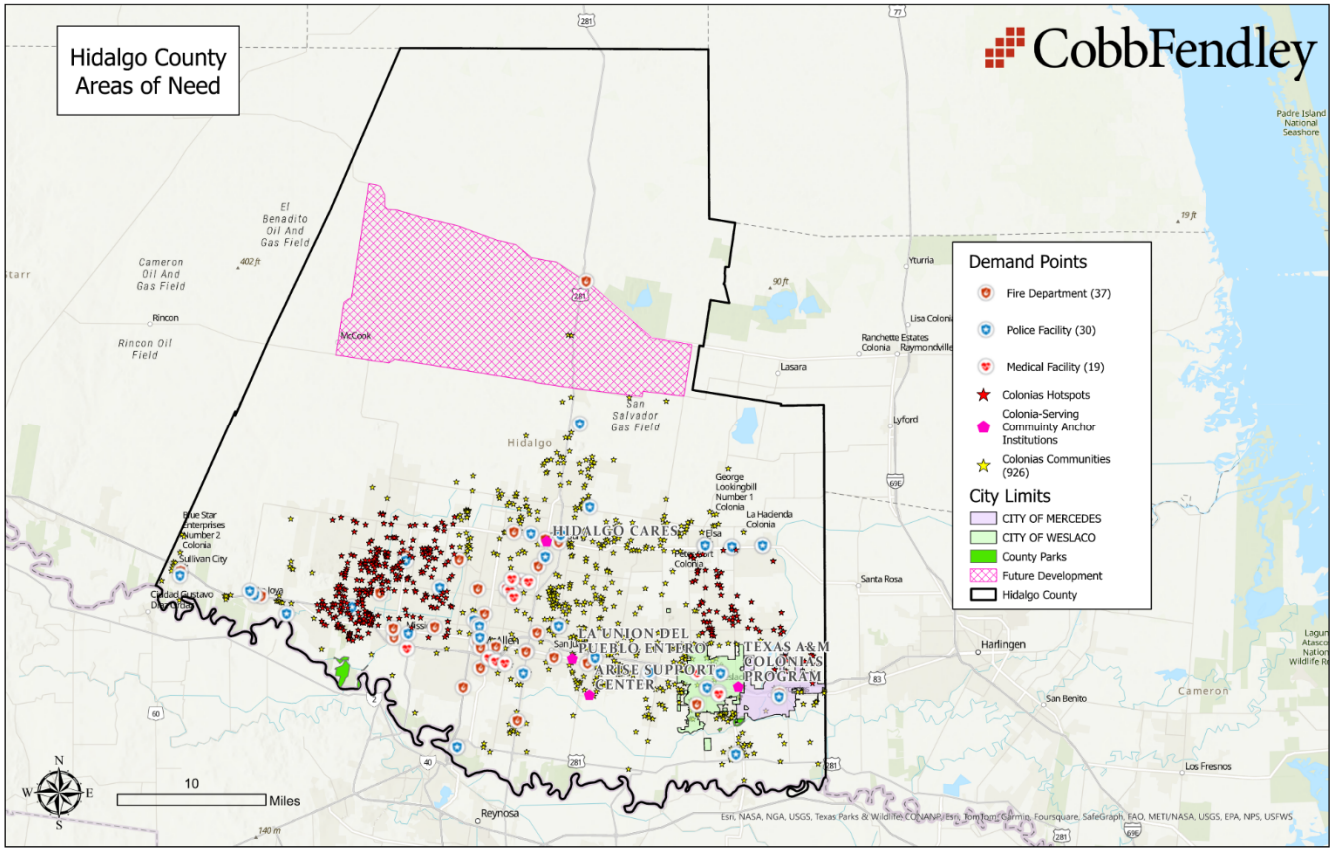

Figure 56: Hidalgo County Areas of Need

5.2.2 Key Elements of the Network Design

The lines within Figure 52 represent linear routing of proposed conduit and fiber paths within the network Middle Mile and includes about 2,062,930 linear feet (or 391 miles) of design fiber infrastructure, as shown with fiber counts 432-blue, 288-orange, 144-purple, and 72-light pink lines. As next steps towards implementation will determine more precise locations and material sizes, only approximate routes and fiber sizing were included within this design.

The primary backbone and backhaul route were proposed to create ring topologies where applicable for County needs with redundancy in mind, to connect communities that are determined as a need, and finally to connect to potential options of existing infrastructure from various stakeholders. The larger loop routing design allows for quadrants to be created which will alleviate any capacity or network demands. Most of the County-owned facilities are located in Edinburg, and this HLD was established to go outwards in each direction from Edinburg as the starting location.

This quadrant-based network design provides additional redundancy for the network to continue by creating nineteen total loops for the County ring topology. The primary distribution ring, to accommodate for the total population of addresses within the County that exist today or will be added in the future, was sized to use 432 count fiber. Any future neighborhood builds that use G-PON or XGS-PON architecture would have plenty of capacity and infrastructure available, even after enterprise needs are met and allocated for.

The point locations on the HLD, as previously discussed, represent various facilities, locations, or communities that were deemed necessary for connectivity within the County by various stakeholders representing their communities. The Middle Mile was designed for minimal Last Mile expansion, so adding additional points from this Middle Mile would be possible in later stages of development. In reaching the various areas of need, the size of fiber was determined based on population of the area, and the demand point in which the fiber is routed to.

In this greenfield design, 72 count fiber was utilized to connect facilities within a short distance from the Middle Mile, 432 count fiber was included in more dense areas within a near proximity to the main distribution line, 288 and 144 count fiber was used where communities were less dense and further located from the Middle Mile ring. Overall, this design of the Middle Mile was created to efficiently meet the needs of the County, be cost effective, and limit any Last Mile connectivity for residential and enterprise needs. For the laterals included for public Wi-Fi referenced in 2.3.2 Insight's Case Study for Implementation of Public Wi-Fi in Hidalgo County, 144 count fiber ensures proper connectivity in case of emergency and additionally will promote growth for nearby future projects. The sizing of the fiber provides allocations for various network components such as backhaul for Tier 1 transport, localized transport and backhaul, and the various front haul applications (FTTx).

The conduits along this route are upsized to the size and quantity of 2-1.25" conduits, to account for significant network traffic, allocating both physical spaces with spare conduit. 432 count fiber was proposed to be in 2 - 2" conduits due to the sizing of the strand diameter. Multiple conduits are included for redundancy, but also in case spare conduit could be used for revenue generating for the infrastructure owner or for any additional future needs.

The total linear footage of all these values can be seen in Table 10. Slack was included as an estimate based on where handhole locations would be, approximated to account for any future build and redundancy needs. This is included for cost estimate purposes rather than HLD needs.

Table 10: Quantities for Greenfield and Gap Analysis HLDs

Greenfield HLD Quantities	
Fiber Size	Linear Footage
432F	641,621
288F	113,997
144F	1,237,275
72F	70,037
12F	21,500
Estimated Slack	26,929
Conduit Size	Linear Footage
2-1.25"	1,421,309
2-2"	641,621

Gap Analysis HLD Quantities	
Fiber Size	Linear Footage
432F	78,802
288F	32,994
144F	201,730
72F	29,534
12F	21,500
Estimated Slack	9,731
Conduit Size	Linear Footage
2-1.25"	264,258
2-2"	78,802

Not shown within Figure 52, but incorporated within cost estimates provided later within the report, for Last Mile connectivity to all the demand points the network route is proposed to allocate 12 strands of fiber to converge from outside plant (OSP) operations to inside plant (ISP). This effort will help fully interconnect the various demand points deemed essential by stakeholders. An estimate of 250 linear feet was assumed for this operation and should be viewed as a conservative and overly estimated value. Some locations may be within proximity of other demand points or existing connections and may not be necessary for a full 250 feet. However, as most of these facilities are public or emergency-related, the connectivity of these demand points is essential to allow for safety of connectivity during emergencies and ensuring communication during the most critical events.

Other inside plant considerations to the network build for connections to core network facilities such as data centers, distribution points of presence (POPs), customer premises, and other network assets outside of the public right-of-way (ROW) are likely to be decided upon by potential partners. Based on the HLD, a Data Center would be best located within the areas near McAllen, Pharr, or San Juan, with POP locations at various end points of each quadrant as well as within each city or town throughout the County.

This HLD was created with buried fiber and conduit in mind. Aerial pole infrastructure is another recommended method of routing this design and may be considered more advantageous than burying conduits to some, primarily in terms of cost and time management. However, buried fiber, while it comes with its own sets of negatives, will be the safest method of maintaining the integrity of the fiber and conduit. The main reason for this consideration was due to the proximity to the coast of the Gulf of Mexico for the County, and the frequency of hurricanes within southeast Texas. Underground facilities are more likely to operate in times of emergency compared to pole infrastructure.

Regarding Last Mile needs, fixed-wireless may also be an option for the residents within rural Hidalgo County, as it is a cheaper and faster build out compared to FTTP, but traditional licensed fixed-wireless networks operate within a fiber backbone. This design would still apply for any fixed wireless needs. An estimated swath of coverage could be assumed conservatively of a five-mile radius from tower locations. While fixed-wireless for the end user cannot reach top symmetrical speeds today like fiber-optic cable can, it is still more than suitable for today's needs and the needs of the immediate future, under optimal usage.

Specifics and additional details for various methodologies described above will be expanded upon in the sections below.

5.2.3 Last Mile Considerations

In a fiber network, the Middle Mile and Last Mile are distinct segments that play crucial roles in delivering high-speed internet and other telecommunications services to end-users.

The Middle Mile refers to the part of the network that connects various local communities or neighborhoods to larger data centers, internet exchange points, or network hubs. It acts as a bridge between the backbone of the network, which spans across cities and regions, and the Last Mile connections that reach individual homes and businesses. The Middle Mile is typically made up of high-capacity fiber optic cables and plays a key role in aggregating and transporting data over longer distances. It ensures that data can flow efficiently from the broader internet to the local level, where it can then be distributed to end-users.

On the other hand, the Last Mile is the final leg of the network that directly connects individual homes, offices, and businesses to the internet service provider (ISP) or telecommunications company. This segment often involves shorter distances but presents challenges, such as navigating through densely populated urban areas or reaching remote rural locations. The Last Mile infrastructure may include various technologies like fiber optics, DSL, cable, wireless connections, or even satellite links. It's a critical component because it determines the actual speed and reliability of the internet service experienced by end-users. Building and maintaining efficient Last Mile connections is a priority for ISPs to ensure fast and consistent internet access for customers.

In Figure 57 a Last Mile High Level Design can be found. It involves meticulous planning to ensure efficient coverage and optimal connectivity. With a total of 8,384 addresses to cover, all of which are unserved and underserved addresses per the FCC, strategic allocation and distribution of fiber sizes are critical. These will be strategically chosen based on the number of addresses in specific areas.

PONs (Passive Optical Networks) are utilized to cover areas ranging from 400 to 576 addresses, assuming through the use of a 576 sized cabinet, providing a balance between coverage and network efficiency. This design optimally caters to the last leg of connectivity, ensuring a robust and reliable network infrastructure for the specified number of addresses while aligning with the technical requirements and demands of the project. The PON based polygons seen within Figure 57 were crafted in a manner in which an efficient amount of underserved or unserved addresses could be covered through this topology. In the more rural areas of Hidalgo County, primarily up north, where the PON sizes are more spread out, homerun-based architecture should be assumed to provide Last Mile Connectivity. The number of addresses within each PON polygon can be seen both within the map, and within the legend of Figure 57.

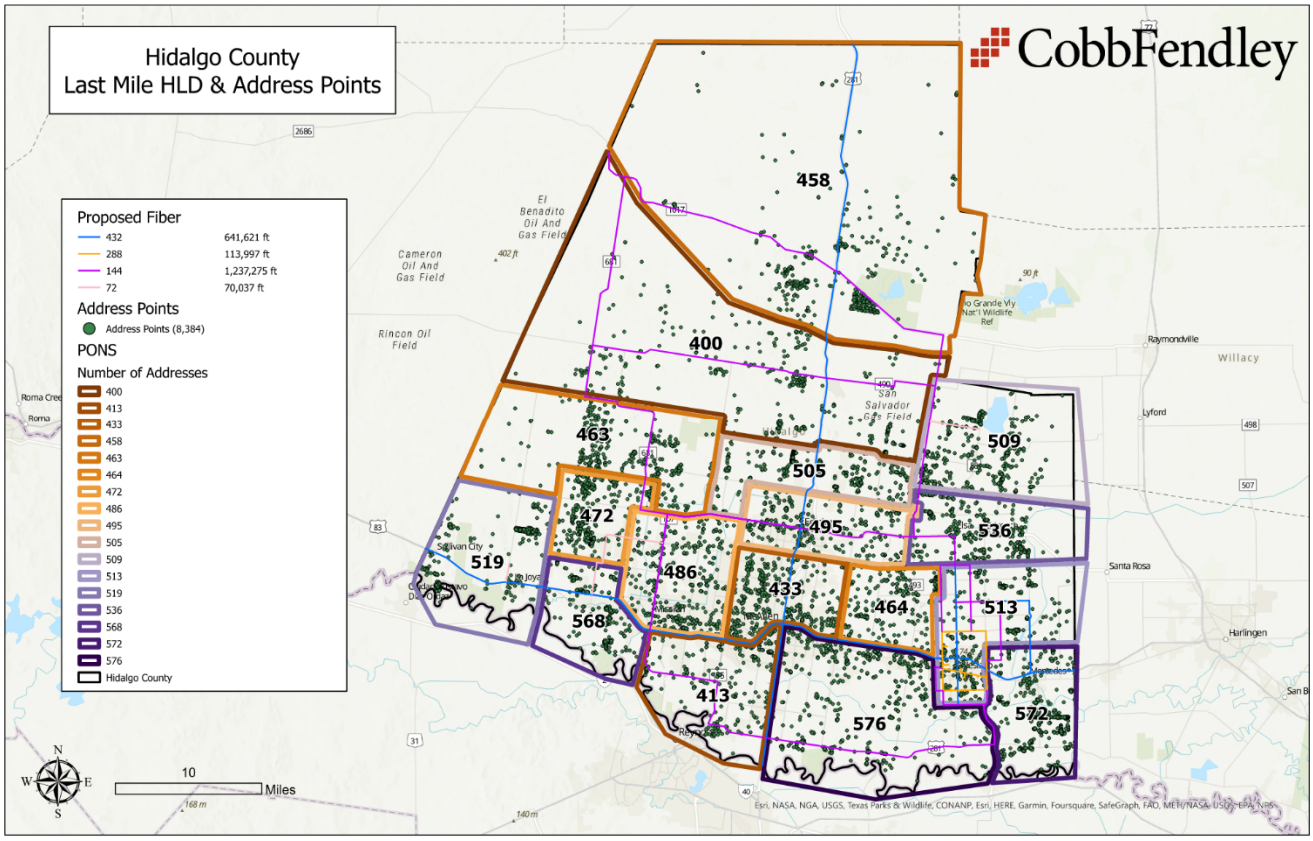

Figure 57: Last Mile HLD & Address Points

5.3 Methodology for Design

The Outside Plant (OSP) is the most visible and physical component of a fiber-optic network within the public right of way (ROW). This fiber-based, centralized core network primarily aims to support an access network for internet and data services. Foundationally, this allows for flexibility in access architectures that Last Mile providers can implement and converge to meet the market needs. Both fiber wireline and wireless broadband solutions can facilitate the Last Mile while meeting the service level requirements recommended in this study and set by the NTIA for funding eligibility.

OSP includes the civil engineering and construction to design and install underground conduits, fiber optic cables, handholes, and splicing cases among various other components. The outside plant is designed, constructed, and implemented per both jurisdictional and owner standards. In this case, there were not excess jurisdictional standards to be met regarding applicable clearances from existing utilities, placement in the ROW following required typical cross section alignments, and other specified design and construction standards. Placing the fiber route within the Texas Department of Transportation (TXDOT) or Hidalgo County ROW was the priority where possible. TXDOT ROWs already contain most long-haul utilities and have utility pole infrastructure, green space for buried construction, and a utility accommodation process in place to allow for simplified design, permitting, and construction measures.

In this HLD, the focus is primarily on the Middle Mile infrastructure need, while suggesting the Last Mile providers consider all manners of broadband technology solutions to reach the designated areas of need. The design has the potential for scalable applications and is recommended as the primary access network architecture where applicable.

5.3.1 Network Topologies to Serve Urban and Rural Markets

While the cities typically have a significant urban population, the expansive neighboring communities contain varying degrees of rurality. As there are established broadband needs in both urban and rural areas, the Middle Mile footprint needs to distribute out in all directions and to each corner of the designated boundary, so that each fiber cable, or spoke, can be centrally located for an effective serving area. In new fiber builds with no existing infrastructure, known as greenfield, this approach is used to start with a centralized location in the middle of the marker, then start dividing that marking into quadrants, representing the sub-service areas that need to be served.

It is important to reiterate that although the Middle Mile does not route directly through each community, additional laterals and Last Mile services to all other targeted areas can now be connected to this network, given the established proximity and improved feasibility through this effort. However, it should be noted that in rural communities where population density is lesser than that of urban areas, more infrastructure is typically needed to reach residents, and therefore should be considered in the project costs. By extending fiber from the centralized location across the middle of these quadrants, any demand points on either side of the fiber can be tied into the network without extensive laterals going from one end to the other. The Middle Mile leverages a couple of network topology elements to position the network to capture as many communities that meet as many broadband-needs criteria as possible.

The ring-based topology allows for redundant connections to demand points by the lateral extensions connecting back to core network infrastructure, which are “self-healing” or can redirect connections if any part of the ring is damaged or undergoing maintenance. Many business and commercial properties require this kind of connection as it eliminates or at least reduces any downtime for network maintenance or damage.

Identifying assets that may be utilized to promote broadband deployments, such as streetlights or existing conduits, could also help consolidate an efficient implementation process and be more cost effective for rural and urban areas. This type of data is likely proprietary in nature and cannot typically be shared publicly. However, in the next stage of this feasibility study process when producing a Request for Proposals, the County can ask for those that respond to specifically respond with data of existing infrastructure. While that will likely not be something the County can keep and display publicly, it will help add an additional layer to this situation for where active broadband assets exist. Using the layers that could be obtained, the County-wide Middle Mile was created to reach or be in the vicinity of these areas of need.

5.3.2 Aerial Attachment Considerations

The necessity of accessing existing pole infrastructure is critical for implementation while understanding the positives and negatives of a purely underground solution, such as the potential impact to construction costs and timelines. In areas with harder soil conditions, boring and trenching can be incredibly expensive and may delay project timelines. Where the hard soil conditions overlap with existing utility pole infrastructure, pole attachment for an aerial route is recommended. While Hidalgo County soils are mostly favorable towards buried construction, the availability of pole infrastructure should be considered to reduce additional disturbance of the ROW and can be leveraged to mitigate maintenance issues associated with flood-prone areas. Buried fiber is generally more protected, as it is less exposed to wind events or damage from traffic accidents or vandalism. Aerial attachments of the fiber-optic cable include the following conditional benefits:

- The cost to attach to poles is generally cheaper than burying underground, especially within hard rock conditions, although some pole owners may have increased pricing due to terrain demands. This is likely not an issue within Hidalgo County.
- The time to completion for this method of fiber routing is typically faster compared to underground trenching or boring, even though pole analysis for each pole needs to be conducted before attachment.
- Construction of aerial attachments is less likely to damage existing utilities within the ROW given the visibility of existing attachers and power conductors. SUE or utility locates are required to avoid conflict with existing buried facilities which are not visible to the contractor.
- When repairs are needed to fiber attached to a pole, the procedures and timing are more efficient which greatly reduces downtime.

5.3.3 Material and Capacity Considerations

As previously discussed throughout this study, existing broadband infrastructure is present throughout the greater County area and so the potential for overbuilding is a factor that should be considered given the eligibility requirements for NTIA grant funding. As such, it is even more important to leverage these existing assets to reduce overall build costs and minimize overbuild. Fiber, conduit, handholes, facilities with space for collocated equipment, poles, and tower structures should be considered when exploring partnerships. Compatibility with the proposed infrastructure is especially important as existing assets may not have the required capacity from a physical space perspective in conduit and ducts or available dark fiber in existing cables. When sizing for capacity, both physical and network aspects are considered.

The proposed conduit system would consist of 2-1.25” (or 2” for the 432-count fiber) HDPE pipes, allowing space for overpulling additional fibers, maintenance, and potentially leasing. Fiber cables would be upsized to allow for growth in the Middle Mile and any distribution directly off the cable to demand points along the route. The additional capacity in the proposed fiber cables promotes growth, redundancy, and a potential source of revenue via dark fiber leasing. Any laterals and ring routed design help carry the bulk of the network across the County and facilitate fiber lateral construction to help expand the network to various locations that could be considered Last Mile, which includes any stakeholder-provided demand points or tower locations. For the transition of OSP to ISP, whether at tower locations, demand points, or anywhere else, responsible fiber sizing and allocations ensure proper connectivity in case of emergency and additionally will promote growth for nearby future projects.

For the capacity of the network, the most crucial factor to consider is scalability. The capacity of a large County-sized network will not experience the same demand today that it does ten to 20 years from now. As the surge capacities for each identified demand point and future demand points are unknown, a lower capacity is manageable and can increase as the network traffic is monitored and analyzed. This is the most economical and responsible method to scale the network capacity. While this does not necessarily impact the routing, it is important to consider in terms of the inside plant facilities the relative space needed for equipment and associated costs. Network technologies have allowed for existing infrastructure to yield more capacity than when originally placed by smarter network routing and multiplexing.

When reviewing network capacity, it is important to understand that there is traffic that stays within the network to communicate within and between the connected facilities, and there is also traffic that needs to leave the network and connect to a larger access network such as the internet. Traffic that leaves the network requires transport circuits, the capacity of which is dependent upon the scale and consistency of the traffic. When determining the transport capacity, it is important to consider that this is easily scalable and does not need to be sized to the future anticipated growth of the network.

From a cost-savings perspective, transport capacity should be estimated to meet the immediate needs, monitored, and increased as the network grows. This concept not only applies to transport, but also to all network links or connections. The estimated capacity requirements for example demand points based on their function or as recommended by the stakeholders can be seen in Table 11.

Table 11: Proposed Capacity Based Upon Location Type

Location Type	Proposed Capacity per Location (GB)
AIRPORTS	1-3
LOCAL GOV. FACILITIES	1
FIRE STATIONS	1
MEDICAL	1-3
POLICE/SHERIFF	1-3
SCHOOL	5-10

Another key concept when considering capacity is bandwidth management, which consists of understanding that advanced fiber networks can control traffic in ways that individual links are making efficient use of bandwidth through techniques such as multiplexing. What this translates to is that individual capacity estimates for customers represent the absolute maximum capacity needs which will rarely, if ever, be required at a given time. These links share bandwidth where applicable and so the determination of the network capacity is not simply a summation of all estimated max capacities. Instead, it is based on an estimation of the surge capacities.

As the surge capacities for each currently identified demand or future point is unknown, it is logical to begin with a lower capacity that is manageable and increases as the network traffic is monitored and analyzed. This is the most economical and responsible method to scale the network capacity. It is also the reason that future proofing and modularity of network components are critical as they need to have the ability to scale with the network from both a distribution and capacity standpoint.

With the understanding of the concepts above and capacity estimates for all demand points, it was determined that a good starting point for the network would be two 40GB transport circuits for redundant connections to the access network. The backhaul links should be 100GB between network data centers and distribution POPs. Individual demand points in the Middle Mile will have anywhere from 100Mb-10GB links depending on their classification and anticipated needs. However, as proposed infrastructure is likely to be a part of a growing network, the ideal partner should be able to cover these estimates, if not more.

The HLD as presented in this section represents the collective understanding of the existing conditions, needs and gap analysis, stakeholder/partner capabilities and assets, broadband network design criteria, and with consideration for scalability, futureproofing, economic growth, and regional connectivity.

5.4 Additional Considerations for Broadband Network Implementation

Network implementation is one of the most complex and challenging portions of establishing a broadband network. Preliminary engineering was conducted as a necessary part of this study to determine capacity requirements of the proposed network footprint, network equipment, efforts to ensure modularity and futureproofing of the network, and external environmental constraints in constructability and sustainability. Most of these items below are needed for the greenfield design approach, and less likely for potential partnerships as providers may already have these matters covered for future-proof scenarios. However, with any proposed infrastructure the additional capacities and materials are likely to consider growth of the supporting implementation elements. More information can be found on these topics below.

5.4.1 Network Architecture

Last Mile network architectures such as Gigabit Passive Optical Networks (GPON) share capacity among multiple customers and are typically seen in fiber-to-the-home network builds. The latest variant of this architecture is XGS-PON (or 10 Gigabit Symmetrical PON) which follows the same concept but is not limited to 1GB connections and can support variable optics up to 10GB. This architecture can be used to service thirty-two or more large customers requiring up to 10GB services on the same active link.

Fixed-wireless Last Mile solutions also provide an opportunity to share capacity between multiple customers, with the advantage of reducing the wireline fiber build into the customer premise while also providing high-quality wireless connections required in an advanced broadband network. While GPON and XGS-PON are more efficient from a fiber distribution standpoint, fixed-wireless solutions provide the necessary flexibility in Last Mile connections. These proposed network infrastructures must be able to support these architectures and therefore building a robust core network in the OSP with scalable capacity equipment is crucial.

5.4.2 Data Center and POP Considerations

The physical plant must correlate with and complement the network equipment that will ultimately facilitate and manage the network connection. Data centers and distribution Points of Presence (POPs) are where the distribution and core networks converge and connect to transport networks through centralized network equipment.

Data centers are the primary facilities that transport connections house the core/edge routers which manage the network. These locations can be centralized or diversified on opposite ends of the network to provide physical separation for ISP connections. Robust power supply, storage, and management are required at these locations to condition or rectify power and allow the network to operate reliably. Placement of these facilities is dependent on network topology and suitability criteria such as flood adverse locations, security, access to sustainable power sources, and necessary space to accommodate equipment and network staff.

POPs differ from data centers in that they contain mainly distribution equipment and do not typically receive the ISP transport connection and core/edge routing equipment. Distribution POPs are placed centrally, along the backhaul, in customer-heavy areas where the distribution OSP can be condensed and reduced in terms of the physical plant to individual customers. POPs can be as small as a handhole in the public ROW where the network can tie into other networks and leased lines or as large as a data center depending on the required function.

Depending on the capacity needs of the area the POP will distribute into, the required space will likely be no larger than a large storage closet or small room to house distribution switches, patch panels, power supply, and cooling systems. Data center and POP facilities, like the equipment they contain, need to be scalable and should consider the feasibility of future expansion in considering suitable locations. Based on the HLD, a data center would likely be located at the center of the design in the McAllen, Pharr, San Juan general area.

5.4.3 Local Public Policy for Implementation

Ordinances, design manuals, and permitting requirements should be updated and clarified to protect the ROW, but also streamline processes for partners of this initiative, as well as other broadband expansion projects. Civil engineering design considers constructability to develop both an economical design, on behalf of the client, and a feasible design, to ensure the contractor is set up for success. Constructability considerations include understanding soil conditions and the method of construction that is most conducive, whether that is aerial construction, directional drilling, plowing, or trenching. Having a clear-cut process is an enticement for broadband providers as this reduces costly delays and frustration for all parties.

Municipal Engineering and Public Works should have a defined role and involvement on all proposed broadband projects, for both visibility and strengthening relationships with local providers. Successful implementation of the fiber network requires that the preliminary and detailed design engineering work be thoughtful and comprehensive to support the subsequent construction effort, without delay and need for change orders.

5.4.4 Procurement & Equipment

Another critical component of the implementation is continued refinement of the network build Order of Magnitude (OOM) into the detailed bill of materials (BOM), cost estimates, and schedules. The OOM serves as a project charter document that guides the client in the procurement process, especially considering the global shortages and increasing price tag of essential network materials such as HDPE and fiber cable, which are experiencing more than 26-week lead times and quotes are only held for weeks to months at best as demand surges. Given the state of the industry when it comes to the supply chain, it is essential that the OOM is flexible and adaptive to quickly swap out various materials and equipment to provide insight on the updated costs and ensure compatibilities.

Changes in equipment and materials during the procurement process may have impacts on the OSP design and ISP equipment may lose functionality that provides for futureproofing, modularity, and sustainability of the network. Therefore, it is essential to implementation that the services and materials procurement effort is collaborative and deliberate so that these impacts are discussed and weighed before making final decisions so that there is not an excessive redesign of the network through a continually varying BOM. Partnering with well-established operators in the telecommunications industry or contracting purchasing cooperative services presents the most favorable options for procurement, which is key in enabling the implementation of the broadband network build.

5.4.5 Operations And Maintenance

To ensure proper performance, regular maintenance will be needed to repair any problems with the fiber network. One benefit of a fiber network is the low amount of maintenance needed to keep the system up and running. The system should work properly unless there is specific damage that occurs somewhere in the network. It is recommended that to reduce the risk of damage to fiber infrastructure the contractor should install tracer wire with the conduit. The cost estimates in the following section include tracer wire for both middle and Last Mile operations.

The current outlook for maintenance responsibilities is that the partnership collaboration will lead to hiring an operator who would perform all maintenance. During the building phase of the route, the contractor is responsible for the build until it is completed. Therefore, the costs are covered by the builder for any issues that occur during the build phase such as cracked handholes. As the equipment ages, the maintenance needs will grow, especially in more rural areas. Maintenance costs will not be consistent from month to month, especially in the early years of the equipment where they are expected to be more minimal.

To ensure proper performance of the fiber network, some level of permanent staff will likely be needed to monitor the system and perform regular preventative and reactive maintenance. The operator may be planning on leasing fiber strands out to commercial clients for internet access on behalf of the County, and the operator will need staff in place to manage all billings for commercial client use of the network. Effort levels for County staff are dependent on terms of potential partnerships.

Maintenance for the end equipment for each run of fiber located at the network hubs will need to be routinely checked and maintained by qualified IT staff. There are a few options for maintenance of the equipment located in the field, such as the fiber-optic cables and splice cabinets.

Costs for replacement are expected to be low for the first 20 years following construction. However, since all circumstances are unknown initially, the County should consider allocating a portion of funding for a replacement fund. These funds would be utilized in the event of a catastrophic failure where entire portions of infrastructure would be required to be replaced. This would also include end equipment such as switches or routers, which may have expired warranties after 3-5 years. The County may also consider earmarking revenue generated by the system, via commercial clients, for a replacement fund. This revenue, and revenue created via Last Mile networking, could also help pay for any maintenance costs over time.

5.5 Cost Estimate

5.5.1 Infrastructure Costs for Reference Middle Mile and Last Mile Designs

Table 12: HLD Cost Estimate Values

Greenfield HLD Cost Values	
Cost Factor	Cost Value
Cost per Linear Foot	$21
Cost per Mile	$109,274

Gap Analysis HLD Cost Values	
Cost Factor	Cost Value
Cost per Linear Foot	$24
Cost per Mile	$127,388

Table 12- Greenfield HLD Cost Values provides an estimate of the construction cost for the Middle Mile network if Hidalgo County were to independently undertake this project without any collaborative partners. This estimate encompasses the required infrastructure as outlined in the High-Level Design (HLD) and assumes an underground buried construction approach. It's important to note that values presented in Table 12-Greenfield HLD Cost Values solely reflect the costs associated with the proposed greenfield design. It is probable that, during the Request for Proposal (RFP) process when selecting potential partners, or partnering with existing infrastructure providers, a significant portion of the required infrastructure could already be in place. Therefore, Table 12- Gap Analysis HLD Cost Values displays the costs of the proposed greenfield design, subtracting the value of any existing fiber infrastructure that could be leveraged. Integrating existing infrastructure into the Greenfield HLD presents a strategic approach that combines the advantages of both established networks and planned enhancements. Leveraging existing infrastructure allows for cost-efficiency, saving both time and resources that would be otherwise spent on entirely new implementations. By utilizing the already established groundwork, the design can build upon a foundation of connectivity, enhancing the overall network's capacity, reliability, and coverage. Additionally, this approach ensures smoother integration and transition, minimizing disruptions for end-users. It also promotes sustainability by optimizing the use of current resources, aligning with the principles of environmental responsibility. Ultimately, the combination of Middle Mile design with existing infrastructure facilitates an incremental upgrade that maximizes efficiency and minimizes costs, leading to an improved and robust network.

Table 13: HLD Quantities

Greenfield HLD Quantities	
Fiber Size	Linear Footage
432F	641,621
288F	113,997
144F	1,237,275
72F	70,037
12F	21,500
Estimated Slack	26,929
Conduit Size	Linear Footage
2-1.25"	1,421,309
2-2"	641,621

Gap Analysis HLD Quantities	
Fiber Size	Linear Footage
432F	78,802
288F	32,994
144F	201,730
72F	29,534
12F	21,500
Estimated Slack	9,731
Conduit Size	Linear Footage
2-1.25"	264,258
2-2"	78,802

Quantities for both HLD Greenfield Design and Gap Analysis HLD are shown above for reference.

The fiber and conduit routes were determined based on current and future demands, promote redundancy, and allow for expansion or leasing options, should the County be interested. For Middle Mile route sizing, fiber sizes of 72FO minimum and 432FO maximum were decided upon, where the larger size is to accommodate the Middle Mile infrastructure and the smaller size is to reach the various demand points. For inside plant related situations, 250 feet of 12FO was assumed per demand point.

To accommodate redundancy or any future building, it was also decided to include 2 HDPE conduits for fiber placement underground. Including more ducts helps aid future adaptations to this fiber build by minimizing construction and labor costs. Additional conduits can also be used for construction done by others for different projects to help consolidate overall disturbance of the ROW. For initial purposes though, this size and quantity of conduit will also help promote safety within the network by having those spare ducts available. However, should the County want to lower costs, reducing to one HDPE conduit is a possible solution.

Due to the nature of the greenfield design, handhole placement was assumed using factors such as spacing, numbers of demand points, and linear footage of fiber. Based on the fiber size and the natural conditions, a 36" x 60" x 24" sized handhole is sufficient to meet the needs of this network throughout the Middle Mile ring and within rural parts of the County while a 17" x 30" x 24" handhole is sufficient between Middle Mile and Last Mile distribution.

Splicing was considered for both middle and Last Mile efforts and the transition from outside plant (OSP) to inside plant (ISP) was also considered for Middle Mile demand points. The assumptions for these conditions include prep splice closures based on sizing, fusion splicing ribbon or loose tube, splitters, and more. For plant transition, the assumptions include 1.25" Plenum Interconnect ducts, Hoffman boxes, building entrances, core drilling, 4" EMT, drop cable, and 12FO for approximately 250' per demand point, and more.

Table 14: Middle Mile Lateral Addition & Last Mile Cost Estimates

Residents	PON Areas
8,384	17
Addresses Per PON	
~493	
Cost Per PON	
~$13,279,757	
Cost Per Home Passed	
$11,268	
Middle Mile Lateral Addition-Cost Per PON	
~$8,207,216	

Table 14 provides an estimate of the construction cost for a Last Mile network if Hidalgo County were to independently undertake this project without any collaborative partners. This Last Mile design is based on PON's in this case there is a total of 17 PON areas covering 8,384 addresses which is an average of roughly 493 addresses per PON. The cost per PON is $13,279,757 and it includes the equipment, cabling, and necessary components to establish the optical distribution network. Additionally, the cost per address involves calculating the expenditure allocated per individual user within a PON area, encompassing both the initial setup costs and ongoing maintenance expenses. This totals an estimated cost of $11,268 per home passed. These parameters collectively guide in estimating the financial outlay required for designing and implementing the Last Mile connectivity through a PON approach, aiding in effective budgeting and resource allocation.

A Middle Mile Lateral Addition becomes imperative once the Last Mile connectivity is established. This crucial expansion serves as the intermediary link, enhancing the efficiency and reach of the Last Mile services. The envisioned Middle Mile Lateral Addition incurs an average cost of $8,207,216 per point of network access (PON). This expense accounts for the necessary equipment, fiber optic cables, installation, and associated infrastructure to ensure seamless connectivity between the central hub or data center and the Last Mile distribution points. This will significantly improve the overall network performance, data transfer rates, and reduce latency, ultimately optimizing the end-user experience for the community or region being served.

5.6 County-Owned Network Cost Analysis

Key findings from a cost analysis pertaining to a Last Mile infrastructure deployment, as illustrated in Figure 57 are outlined in the subsequent table, with a comprehensive breakdown provided in the Appendix. In summary, a County Last Mile network will not attain a positive cash flow after a 20-year period.

Figure 57 displays a detailed plan for the Last Mile High Level Design. This design emphasizes thorough planning to achieve effective coverage and ideal connectivity. It is specifically tailored to cover 8,384 addresses that currently lack adequate service, and are considered Underserved or Unserved, aligning with FCC requirements for funding and grants.

Projections include assumptions of conservative overhead investment and staffing and can be seen below.

Assumptions Include:

- Initial Investment - $268 Million, 4.75% Interest Rate, 20-year debt
- Penetration Rate – 37% or 2,400 homes by end of year 4 (50 homes/month/year)
- Residential Pricing - $70/month for year 1 and a $5 increase every three years following
- Business Pricing - $100/month for SMB100, $150/month for SMB300, $250/month for SMB500, and $450/month for SMB1000. Beginning in year 3, we added 3 users/year for SMB100, 300, and 500, and 1 user/year for SMB1000. Enterprise pricing is $750/month, and we added 1 user/year beginning in year 3.
- Employees - Network Admin, Outside Plant Technician, Inside Plant Technician, Field Crew (3 Personnel Total) Admin Asst, and 1 CSR in year 1. Beginning in year 2, we added a PT CSR for the next 3 years.
- Year it Cash Flows – Does not cash flow.
- General Fund - General Fund would need to subsidize over $103 million in the first 6 years.
- 20-year return on investment – None
- Personnel and R&M Expenses were increasing at 5% per year; Services and Supplies were increasing at 3% per year

Table 15 examines the first five years and years 15 through 20 of how profitable a county-owned network would be for Hidalgo County using these assumptions.

Table 15: County-Owned Last Mile Cost Analysis Summary

First 5 Years					Years 15-20				
1	2	3	4	5	16	17	18	19	20
24/25	**25/26**	**26/27**	**27/28**	**28/29**	**39/40**	**40/41**	**41/42**	**42/43**	**43/44**
Total Revenue									
$626,063	$1,193,063	$1,795,658	$2,547,878	$2,854,766	$4,047,356	$4,096,496	$4,145,636	$4,375,460	$4,425,356
Total Expenditures									
$22,165,617	$22,233,800	$22,304,115	$22,376,631	$22,420,004	$23,000,827	$23,064,521	$23,130,305	$23,198,251	$23,268,434
Net Income/ Loss									
-$ 21,539,555	-$21,040,738	-$20,508,458	-$19,828,753	-$19,565,238	-$18,953,471	-$18,968,024	-$18,984,668	-$18,822,791	-$18,843,078
Beginning Cash									
$0	-$21,539,555	-$42,580,293	-$63,088,750	-$82,917,503	-$295,443,693	-$314,397,164	-$333,365,189	$352,349,857	$371,172,648
Ending Cash									
-$21,539,555	-$42,580,293	-$63,088,750	-$82,917,503	-$102,482,741	-$314,397,164	-$333,365,189	-$352,349,857	-$371,172,648	$-390,015,726

5.6.1 Additional Considerations for Data Center, POP Locations, Towers, and Aerial Costs

Data Center and POP Location construction and upgrades were not considered in the materials estimate. The proposed solution would require at least one data center (a large room with specific HVAC and electrical needs) likely within the City of Edinburg, and then either one large POP location (located within a spare room/ closet) within each of the larger network quadrants, and a smaller POP location (an external large handhole) per each major city or town within the County.

As expected with the County going through an RFP process, these locations are likely to be filled with the necessary components and managed by a potential partner. County staff would then not be necessary. Materials needed for these locations would include port line cards, breakout cables, aggregation cards, transceivers, chassis shelves, DDOS appliances, distribution switches, firewalls, patch panels, servers, batteries, rectifier systems, generators, mounting hardware, and other various building upgrades.

Data centers and POPs could co-locate with established County-owned or City-owned buildings and would therefore not require the purchase of new facilities. A passive infrastructure model would be the most cost-effective way for the County to include these locations. Based on the HLD, it would be advantageous to use a location within the McAllen/Pharr/Edinburg area due to its centrality of the County as well as representing the center of the Middle Mile design.

Just as careful considerations apply to data center and Point of Presence (POP) locations, similar deliberations are essential when it comes to selecting tower infrastructure for fixed-wireless solutions. Fixed-wireless options are well-suited to meet future-ready requirements. When evaluating the most future-proof infrastructure for any entity, municipality, or provider, especially when substantial funding is involved, prioritizing long-term viability has been a primary focus in this design.

However, when it comes to fixed-wireless options, additional factors come into play. Whether the intention is to co-locate equipment on existing towers or propose the construction of new towers, different considerations apply to each scenario.

In the context of co-locating on existing towers, it's reasonable to estimate that the co-location process itself will incur costs ranging from $20,000 to $75,000 per tower. The specific cost is contingent on factors such as the number of antennas or radios already installed on the tower, as well as the equipment required on the ground. On the other hand, the estimated cost for erecting a new tower may be approximately $200,000. Additionally, providing various equipment for end-users is necessary, and this can encompass expenses ranging from $500 to $3,000 per user. These considerations are pivotal in making informed decisions regarding fixed-wireless infrastructure.

For ground equipment, factors that can impact pricing would be determining the number of cabinets required, whether or not a generator is required, the current situation of sending power to the tower from the local energy provider, the ease of access at the tower, and more. If proposing a new tower is a viable option, then costs for this situation will vary based on the height of the tower with costs ranging from $100-200k per tower should be expected. For adequate consideration of locations, the ground conditions for foundations, tower ancillaries, and ground equipment are required. If the tower height needs to be higher than anticipated then the amount and types of equipment will need to be updated to reflect those changes which will also impact costs.

Furthermore, outside of material and labor costs, additional considerations for towers will include various regulatory requirements. Each tower proposed will need several environmental studies completed that range from geotechnical soil analysis, to bird flight path migratory patterns, and even protected wetland or tribal area evaluation. The FCC has regulatory compliance documents that will need to be completed which include NEPA, SHPO, Tribal, 1A/2C, and more. All of these considerations, and more, can be further detailed in supplementary developments.

It should also be noted that aerial implementation of fiber-optic cable is another option for cost saving measures. However, underground placement was considered throughout the design as it is the safer option for the material, whether it would be protected from weather events such as hurricanes or even other construction related pole incidents such as car accidents.

6 BUSINESS MODEL OPTIONS

Hidalgo County has made it clear that the next steps after this study towards implementation are likely to occur from partnership opportunities through an RFP Process. In that situation, many of the various business models that an entity could choose from when helping expand a broadband network will be dependent on which company matches with the County through their next steps. However, while additional details or projects may grow out of this study, supplementary options are included below that can help the County grow its broadband presence.

There are multiple, applicable business models to consider for County broadband projects with Middle Mile, Last Mile, and digital equity components. These models are determined and shaped based on available funding opportunities, potential partner capabilities and levels of investment, community and public utility stakeholder input, actual demand and anticipated take rates, forecasted economic output, and regulatory framework at the regional and national level. Fortunately, there are many diverse funding opportunities and a tiered range of options to build catered versions of these models since the needs of counties/municipalities and broadband infrastructure are not the same. The models listed below should be considered base ownership and operation models and would then be further developed and defined through subsequent phases.

6.1 Considerations For Business Model Selection & Partnership

Before evaluating and planning for the appropriate business model, some base considerations will conceptualize the necessity, values, and risks of County broadband networks in any form. The first and most apparent consideration is the necessity of County involvement further than the promotion of the issues and driving initiatives to improve broadband access and adoption. This study presents findings and data which can help inform this consideration. In many cases, the study and initiative itself drive private sector action and spur modernization of incumbent networks and draw attention to new providers to saturate the market. While there may be some private sector movement, there is no guarantee that it will be to the extent that the County envisions and there are still additional incentives for the County to play a role in broadband development.

Counties/municipalities can benefit from improved broadband network infrastructure in their network operations and applications across departments and public service components, such as Supervisory Control and Data Acquisition (SCADA) and Automatic Meter Reading system (AMR) for public utilities. Cities and counties are often considered a tier one commercial account for providers and so they are a potential benefactor in the initiative and an attraction for partners to provide commercial services.

Local governments can influence how broadband deployments are implemented through public policy, which can serve as both an incentive in a partnership and to manage the public ROW and protect community interests. Regardless of the selected model, or variant, those counties/ municipalities and jurisdictions involved in the initiative must consider their standards when it comes to new broadband infrastructure. Local governments can introduce further financial incentives in the form of subsidies or tax credits, incentivizing providers, and adoption. County infrastructure can be leveraged as broadband assets and reduce costs or provide revenue generation. This concept applies to existing assets such as water towers and properties for co-located ISP facilities in addition to any broadband-specific assets the County may own as a part of a proposed network.

In exploring these models, the County and partners must consider shared risks and incentives, areas of expertise and resourcing, and take measures to ensure a healthy competitive market.

6.2 Ownership & Operations Models

There are three primary models based on the level of involvement of counties/municipalities and private partners, across three network service components: Infrastructure, Access, and Service. The infrastructure component consists of civic components such as conduits, poles, dark fiber, and handholes. The access component comprises electronics and services to "power" the network and connect it to transport networks. The service component covers providing the actual commercial and residential services to the end customers.

The three models reflect the inclusion of one or more of these components, starting with the least involvement in the infrastructure component, adding access, and then finally service. Respectively, these models are: Passive Infrastructure or Infrastructure Only, Wholesale or Operator Owned, and Fully Integrated or Full-Retail Service. Multiple common terminologies are provided as these vary across County broadband model studies.

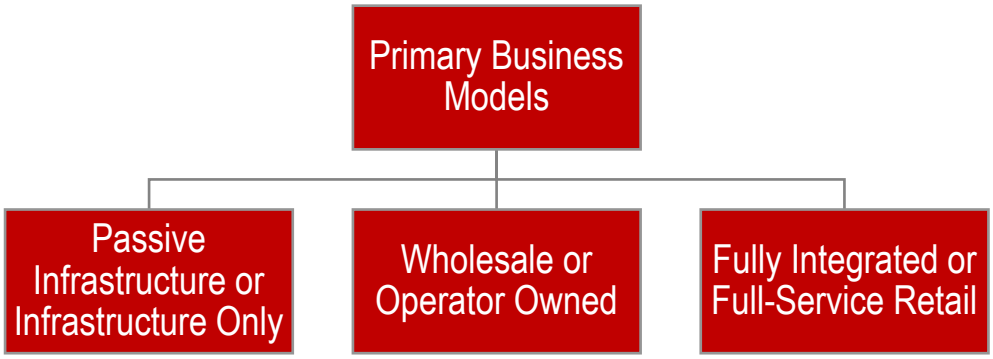

Figure 58: Primary Business Models

It is important to note that there are accessory models within these base models such as Open Access, Public Policy Focus, Public Services, Commercial Focus, and Residential Focus. These accessory models focus on specific needs within the base structure, for example, a County may want to pursue a Wholesale model where they provide both infrastructure and access components, but only for target commercial customers (Commercial Focus) or local government facilities (Public Services). The Open Access model is inherent in both the Passive Infrastructure and Wholesale models where there is a neutral operator and can be used to promote healthy competition of providers at the access and service levels. Depending on the range of scope for the County broadband initiative, there may be multiple models and accessory models to serve different purposes.

6.2.1 Passive Infrastructure | Infrastructure - Only

In this model, the County's involvement is limited to facilitating some or all the passive infrastructure needed for the broadband network. Passive infrastructure only includes the labor and network materials at the physical layer, such as conduit, dark fiber (fiber not being actively used), utility poles, towers, buildings, and properties for Data Centers and POPs. This infrastructure is usually the most costly and essential to support the network but does not include the necessary transport equipment and connections for access or equipment and provisioning for internet services. A private sector provider or operator would manage the access and service components.

The County has the option to own and lease or sell some or all its infrastructure to broadband service providers or operators. This model allows for fully open access at both the access and service levels given the County enters an agreement with a neutral operator where the network infrastructure is available to both access providers and service providers.

Typically, the passive infrastructure does not include residential development as this is often costly and there are many implications in the access and service levels that need to be considered in the design and implementation. This model is effective to incentivize operators and providers to serve otherwise cost-prohibitive areas of need. If the County retains ownership of the infrastructure and opts for the leasing option, there needs to be a clear delineation in the agreement with the operator or provider as to maintenance.

Ownership of the infrastructure may be beneficial to the County given fixed costs, indefinite use, ability to influence the cost to consumers, ensure equal access across the communities, and can be leveraged for public services and applications. These benefits of ownership need to be weighed with the cost and resources required for maintenance, competitive rates for lease while ensuring ROI, and the potential for the open access components to dissuade providers from entering the market.

6.2.1.1 Lease and Selling Options

The following are options the County would have in terms of the sale or lease of infrastructure assets:

- Purchase Agreement: County would be paid upfront or through annual payments and transfer titles
- Indefeasible Right of Use: County would be paid upfront with annual maintenance payments for a certain capacity of their fiber for ~10-20 years
- Lease: County would be paid monthly for use of infrastructure assets for ~3-5 years
- Asset Swap: County could exchange assets and would transfer titles accordingly

These options also apply from the opposite perspective, should the County look to purchase or lease infrastructure from operators or providers.

6.2.2 Wholesale | Operator Owned

The Wholesale model increases the involvement of the Passive Infrastructure Model to include the County facilitating the access component, including all necessary equipment and transport services to activate the network. In this scenario, the County could be the neutral operator, responsible for providing wholesale broadband access to private operators or providers. The County may still opt to engage a private operator as they typically prefer to own the access component and sell it to providers.

This is often a large step toward a full-blown Fully Integrated model and requires increased staffing and expertise. For this reason, Public Private Partnerships are often a more viable solution for counties/municipalities considering this option. From an open access perspective, there is still full competition from service providers as the access component is now the responsibility of the County.

When a County owns the access component and does not contract an operator, there is typically more hesitation from private providers to use the County's network given the relative experience the County has in managing wholesale services and the risks associated. Benefits include more control over the selection of quality service providers and revenue options in wholesale broadband access to operators and providers.

As with the previous model, maintenance, and operations costs will increase and consideration should be taken in that broadband technologies are constantly evolving and require more frequent investment than other utilities.

6.2.3 Fully Integrated | Full-Service Retail

With the addition of the service components, the Fully Integrated Model requires comprehensive involvement from the County as the broadband service provider. Counties/municipalities can provide Middle Mile and Last Mile services to residential and commercial customer services from end to end. The County owns the network and can often converge this with other public utilities for billing simplicity and other verticals.

The County is responsible for operations, management, construction, maintenance, network monitoring, billing, marketing, retail offerings, troubleshooting, and customer service. While this model can create significant value, it also assumes the most risk and should only be considered when no willing and capable private sector providers are eager to enter the market or provide the level of services required to meet the needs of the communities. This Full-Service Retail model looks attractive and garners public attention when implemented as there have been remarkable success stories, such as the City of Mont Belvieu, TX's "MBLink," there have also been many failures that can put a County in financial hardship and the burden falls to taxpayers.

Another consideration with this model is that it eliminates the open access concept as the new County ISP would be considered a competitor with private sector providers at all levels. There is space within this model to still allow for healthy competition when the County ISP only serves Unserved or Underserved markets that the private sector has not elected to serve. While a County ISP does need to consider ROI and healthy financial operations, the goals of the County for their ISP often focus on other factors such as promoting local competition to bolster the local economy and target areas that require subsidy or at-cost services to promote adoption.

Successful County ISPs using this model often have advanced economies which can steady concerns over the financial risks in taking on such an initiative. Any County considering this model should strongly evaluate its expertise, capabilities, resources, and the overall necessity of this make-or-break model.

6.3 Accessory Models

The base models above are not rigid and can be catered to the unique needs and capabilities of the County to assume different levels of responsibility and investment. Accessory models accentuate or serve as sub-models to represent some of the more common options associated. As mentioned previously, different models can serve various project scopes as a part of the broadband initiative and so there is no need to resort to a one model-fits-all mentality.

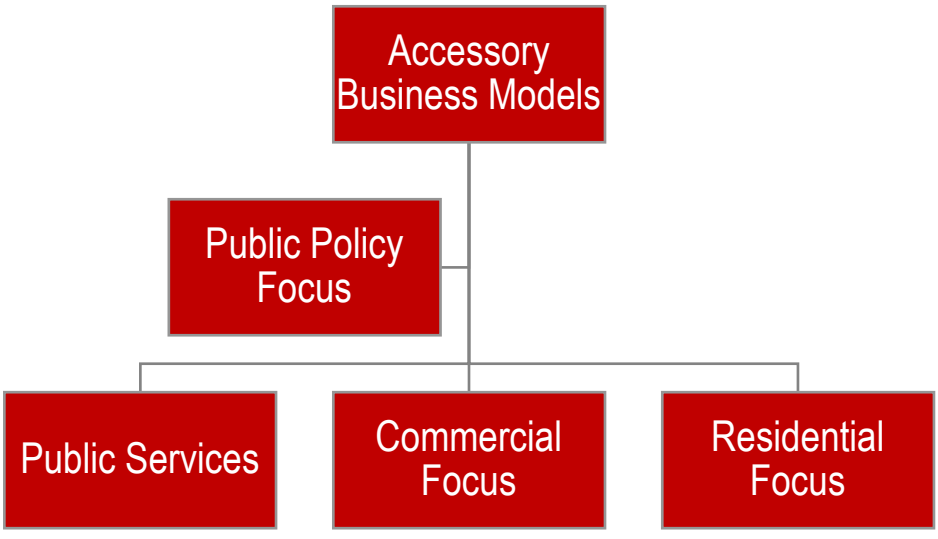

Figure 59: Accessory Business Models

6.3.1 Public Policy Focus

In a Public Policy Focus model, the County can still play a role in promoting broadband expansion through the available policy tools at their disposal, and without having to invest in any of the infrastructure, access, and service components. Consider this model at the lowest end of the risk spectrum, where the County and local government entities facilitate private sector investment through streamlining jurisdictional processes and red tape that might otherwise delay or deter broadband expansion efforts.

Through public policy, counties/municipalities can promote an "ISP Friendly" market and may influence the improvement of services or expansion into areas of need, but it is unlikely that this level of investment will incentivize private providers where they cannot profit.

6.3.2 Public Services

The Public Services model relies on County and local public entity support to address broadband needs solely for public entity facilities and relative applications. Oftentimes, counties/municipalities look to improve their internal services in conjunction with broadband initiatives focused on residential and commercial services. Public sector IT groups typically look to reduce operational and service costs associated with leased lines and Multiprotocol Label Switching (MPLS) networks by building their dark fiber and providing data services to other public organizations.

This model can be considered in isolation, focused on building interconnects between ISDs, public utility buildings, governmental buildings, Emergency Operations Centers (EOCs), and public safety assets. There are many benefits to this which indirectly improve the quality of life for communities that rely on these public services and facilities. Counties/municipalities may also leverage private sector competition to provide these services to incentivize private investment in the residential and commercial areas of need. All three base models can be catered towards strictly public services, where the County can determine its level of involvement.

6.3.3 Commercial Focus

Like Public Services, The Commercial Focus model can utilize one of the three base models to focus strictly on providing commercial services to businesses and commercial properties. The availability of capable commercial services is a huge economic growth driven by attracting businesses to the market and retaining those already currently in place. Most modern, large companies require multiple, redundant connections from tier one providers and so attracting multiple capable providers to the market in the Middle Mile space can be very impactful.

Counties/ municipalities can directly offer these services through the Fully Integrated base model but should consider if their presence in the commercial service space would deter the necessary private sector saturation. As commercial customers are often in the Middle Mile space, open access is a possibility here where there is a known necessity for multiple providers to provide these multiple, redundant services. Commercial Focus can be implemented as a separate scope or as part of a larger initiative including public and residential services.

6.3.4 Residential Focus

Residential Focus is a sub-model to the three base models in which the County would focus solely on involvement in providing residential services. As this is one of the more costly and complex targeted services, in most cases, private providers have the expertise to deploy and operate in residential markets. The risk and investment associated with providing residential services are higher than that of commercial and public services, and regarding digital equity, the greatest needs are often with residents in the Unserved and Underserved communities, and this is where the County's influence can make a significant impact.

A Passive Infrastructure model, catered towards residential focus would be a logical, catered model for a County looking to incentivize private provider saturation. However, open access potential would be limited as residential customers do not require redundant service connections and private providers will likely avoid using infrastructure owned by a County in this space. Residential Focus can be implemented as a separate scope or as part of a larger initiative including public and residential services.

6.4 Business Model Funding

Another layer to the business model determination is the funding aspect, representing tangible investment and risk assumed by the parties involved. Funding a component of a broadband network does not necessarily translate to unique ownership of specific assets as there is a need to ensure that the right party focuses on their area of expertise. For example, while a County may elect to cover the costs of the access components to spur the development of a network, they may have no intention of handling the installation, operations, or maintenance of this component as they do not have the resources nor expertise to manage.

As touched on in the business model outlined above, there are benefits to the County in ownership such as being able to promote open access, lease, and generally have more control over the network. On the other hand, there is an increased risk of crowding out the private sector or discouraging their investment, the learning curve in obtaining the expertise and training to manage and operate, and costs of maintenance and frequent technology upgrades. Weighing all these considerations in mind, a County must determine the feasibility and necessity of public funding or public-private partnership funding.

In isolation, a County broadband network can be funded entirely through public sector means such as bonding, grants, loans, and Community Reinvestment Act (CRA) or Public Welfare Investments (PWI). Other than grants requiring no match, the County has all the financial burden and would not offset costs through private sector investment. As the private sector is constantly looking for where to expand and invest to grow their business, a public-private partnership leverages this pending investment and reduces risk for the County.

6.5 Public Private Partnerships (PPPs)

Public-Private Partnerships take the best of both worlds where all parties focus on their areas of expertise and share the risks and benefits associated with the network development. PPPs can allow counties/municipalities to attract private capital when it would not be feasible otherwise[11]. Collectively, the partnership compartmentalizes and accommodates all aspects of the network, leveraging assets from both the private and public sectors for mutual benefit. The initial infrastructure investment, operational and maintenance costs, and revenue sharing are all considered in the following PPP contracts.

Table 16: Various Forms of Broadband Public Private Partnerships

Contract	Network Funding	Network Operations	Subscription Fees Collected By	Revenue Share To
Third-Party Run	County	Private Operator	County	Private Operator
Lease	County	Private Operator	Private Operator	County
Special Purpose Vehicle	Both	Both	Both	Both
Build Operate Transfer	Private Operator	Private Operator	County	Private Operator
Concession	Private Operator	Private Operator	Private Operator	County

6.5.1 County-Funded PPP Networks

In a Third Party Run Service Contract, the network is funded and built by the County, but the connectivity and end-user services are provided by a private operator. Subscription fees are collected by the County, possibly through existing utility billing services. The County then transfers a share of the revenue to a private operator to cover costs of operations, maintenance, and quality of service (QOS) expenditures. Allows for a return on capital.

In a Lease Contract, the network is funded and built by the County and then leased by the private operator, who in turn provides connectivity and services. Subscription fees are collected by a private operator and a portion of the revenue is transferred to the County to cover the network rental fees.

In a Special Purpose Vehicle Contract, the network is co-financed, built, and operated by the County and private operator, who both share in the return on investment.

[11] Municipal Broadband Networks—Opportunities, Business Models, Challenge. Ifc.org. https://www.ifc.org/wps/wcm/connect/publications_ext_content/ifc_external_publication_site/publications_listing_page/municipal+broadband+networks. Published 2022. Accessed June 1, 2022.

6.5.2 Private Sector-Funded PPP Networks

In a Build Operate Transfer (BOT) Contract, the County facilitates private investment through a "tender," such as a Request for Information (RFI), Request for Qualifications (RFQ), or Request for Proposals (RFP) to a private operator to fund, build, and operate the network. Subscription fees are collected by the County, possibly through existing utility billing services. The County then transfers a share of revenue to the private operator to cover operations, maintenance, and QOS expenditures which may allow for a return on capital.

In a Concession Contract, the network is funded, built, and operated by a private operator. Subscription fees are collected by the private operator as well. This contract requires that the County allows the private operator access to its resources or assets such as utility poles and ducts. Concession fees are paid to the County for use of their assets.[12]

6.6 Managed Services

Partnerships are not limited to private operators or providers but can also include broadband services companies that do not necessarily own or provide direct internet services. These companies can support the County and their partners in the service activation and service assurance aspects of the network. As previously mentioned, broadband networks are dynamic and complex in comparison to traditional utilities and require substantial expertise, in which the County, and sometimes even the operator or internet service provider, needs external resources.

Managed services are typically catered, modular solutions which fill in the implementation and operational components of the network to include monitoring, troubleshooting, performance analysis, inventory management, cybersecurity, and much more. For a County considering more extensive involvement and ownership, or in a partnership with smaller private operators, managed services companies can assist in standing up the network and making necessary connections to operations and business support systems (OSS/BSS), including billing and notification systems.

Managed services should be considered early in the broadband network development and not as an afterthought when operations suffer or there are delays due to unforeseen complications. Under a Full Retail Service Model, managed services can be essential to round out the County team, providing necessary resources and even training leading towards a potential transfer to a County-run or sponsored ISP.

[12] Municipal Broadband Networks—Opportunities, Business Models, Challenge. Ifc.org. https://www.ifc.org/wps/wcm/connect/publications_ext_content/ifc_external_publication_site/publications_listing_page/municipal+broadband+networks. Published 2022. Accessed June 1, 2022.

7 FUNDING ANALYSIS

Federal sources state that 30 million Americans do not have access to at least minimally acceptable internet speeds and according to the Economic Co-operation and Development (OECD), among 35 countries studied, the United States has the second highest broadband costs. Recognizing these facts, Congress, through the Bipartisan Infrastructure Law identified broadband as a high priority from the initial drafting of the Infrastructure Investment and Jobs Act (IIJA). The final bill allocated $65 billion (out of $1.2 trillion) to several federal agencies with the goal of ensuring every American has access to reliable high-speed internet.[13]

To achieve this goal, 4 key initiatives were identified in the IIJA for Broadband:

1) Deploy future-proof connectivity to all Americans.
2) Provide broadband subsidies for low-income users.
3) Provide funding to accelerate the Country's progress toward addressing both broadband access and adoption challenges.
4) Provide funding to address digital literacy and digital equity.

7.1 Texas Broadband Development Office (BDO)

One of the key components of the IIJA was the decision to place a majority of the funding in the Broadband Equity, Access and Deployment program (BEAD), with the responsibility for administering these funds falling to each state government and US territories' representatives. Each entity is required to develop a state-wide plan for how they will administer the funds to new infrastructure projects at the local level and in order to do so, had to establish a State Broadband Deployment Office (BDO). Some states already had offices overseeing broadband policy and deployment while others have had to form one at the direction of the funding guidelines. In Texas, the State BDO is overseen by the Comptroller of Public Accounts office[14] The Texas BDO office's mission is to:

- Create an accurate broadband map of eligible vs. ineligible areas for financial assistance. The map will have a challenging process to dispute any perceived inaccuracies.
- Establish a long-term, statewide plan that addresses strategies and goals for expanding access to and further adoption of broadband service.
- Award grants or other financial instruments to meet the goals of the plan.
- Set the effective threshold speed for broadband service (25 Mbps download/3 Mbps upload).
- Engage in outreach to communities regarding the expansion.
- Address barriers for future expansion efforts.

As a part of the BDO's mission to create a statewide plan, the Comptroller held multiple rounds of regional listening tours in communities across Texas to gain insights about internet access and collect input for the plan[15] The BDO office produced a Toolkit to assist local communities, service providers, and stakeholders with information and resources to identify community needs and gaps, develop effective leadership strategies for implementation, and analyze funding opportunities[16]

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[13] Fact Sheet: The Bipartisan Infrastructure Deal | The White House. The White House. https://www.whitehouse.gov/briefing-room/statements-releases/2021/11/06/fact-sheet-the-bipartisan-infrastructure-deal/. Published 2022. Accessed June 1, 2022.
[14] Mission. Comptroller.texas.gov. https://comptroller.texas.gov/programs/broadband/leadership/%23mission. Published 2022. Accessed June 1, 2022.
[15] Texas Broadband Listening Tour. Comptroller.texas.gov. https://comptroller.texas.gov/programs/broadband/communities/tour.php. Published 2022. Accessed June 1, 2022.
[16] Texas Broadband Development Office. Comptroller.texas.gov. https://comptroller.texas.gov/programs/broadband/toolkit/. Published 2022. Accessed June 1, 2022.

The Texas BDO developed the following chart to display the current known funding allocations to Texas for broadband initiatives. The $100 million per state listed under BEAD includes an initial $5 million in planning funds for each state to develop its five-year plan. As the State develops the plan, the information gathered and analyzed as a part of this study will be presented to the Texas BDO for review and inclusion in the state planning efforts where applicable.

The $500.5 million listed under American Rescue Plan Act -Coronavirus Capital Projects Fund, is the fund which will include the newly approved Bringing Online Opportunities to Texans (BOOT) program. The BDO was recently approved to allocate $363.8 million of these funds through a competitive grant program designed to fund Last Mile broadband infrastructure projects throughout the state. The BDO states that the program will prioritize projects that serve historically socio-economically disadvantaged communities who are deemed eligible by the State BDO's Broadband maps.

Hidalgo County was not eligible for Round 1 of BOOT funding, but may be eligible for any additional upcoming rounds.

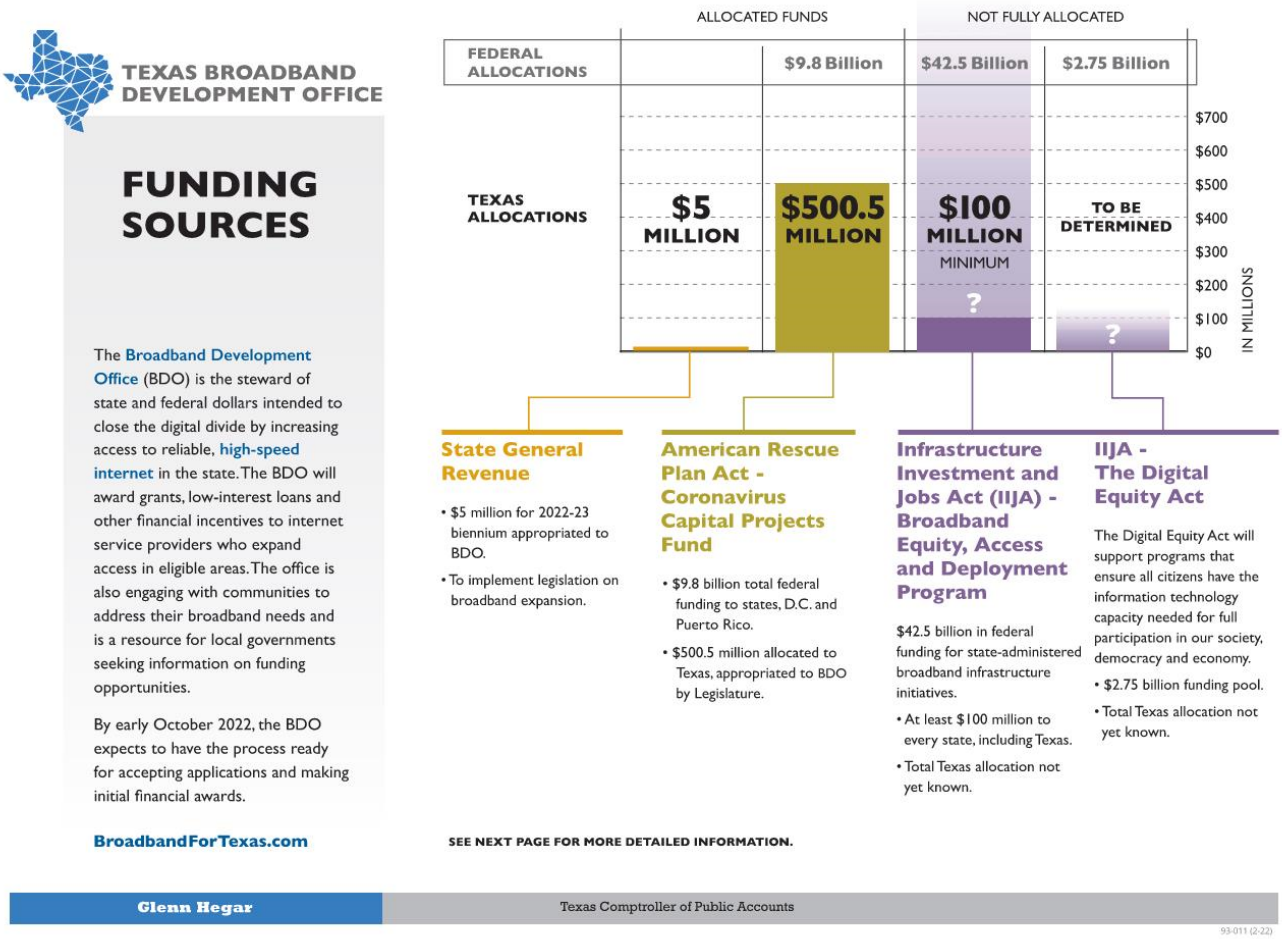

Figure 60: Breakdown of IIJA Funding to Texas BDO

7.1.1 Key State Programs for Hidalgo County Consideration

There are three key programs for Hidalgo County to consider being an applicant or partner on applying include the following programs that will be administered through the Texas BDO. There are various factors for consideration, including match requirements, current levels of service, partnership agreements and other key criteria, which would impact which funding source(s) should be applied for and leveraged collectively to bring as much funding to the County as possible.

It should be noted regarding the BOOT program, while Hidalgo County did not qualify for eligibility for the first round of applications, the secondary round of funding includes a lower eligibility threshold (lower than 80%), likely making Unserved areas in Hidalgo County eligible.

Table 17: Funding Opportunities

Grant Program	Funding Agency	Description	Timeline	Total Allocation
Bringing Online Opportunity to Texans (BOOT) Program- Capital Projects Fund	U.S. Department of Treasury- American Rescue Plan Act (ARPA)	The program is designed to provide internet service with speeds of 100/ 100 Mbps to households and businesses that are deemed eligible (in eligible areas that have 80% Unserved)	Fall 2024*	$363.8 million, $121million available in 1st round (March 2023) for eligible areas. Next round anticipated in the fall.
Digital Equity Capacity Grant Program	National Telecommunications and Information Administration (NTIA)	States to implement plans and promote digital inclusion; additionally, the program funds an annual grant program for five years.	Fall 2024*	BDO was awarded $3.1 million to develop the State Digital Equity Plan. Plan currently in development in coordination with BEAD plan. Expected allocation is $100 million for Texas.
Broadband Equity, Access, And Deployment (BEAD) Program	National Telecommunications and Information Administration (NTIA)	Through state allocation and planning, this program intends to expand high-speed internet access by funding planning, infrastructure deployment and adoption programs.	2025 * (TBA)	$42.5 billion under IIJA. Texas was allocated $3.3 billion. State BDO call for projects in Summer 2024.
Texas Proposition 8 Creation of Broadband Infrastructure Fund Amendment	State of Texas, administered by the Texas Comptroller	HB 9 would create the Texas Broadband Infrastructure Fund (BIF) administered by the comptroller. Funds in the BIF could only be used for expanding broadband and telecommunications across the state	November 2023 *(Ballot)	Anticipated $1.5 billion
USDA ReConnect (Future Rounds)	United States Department of Agriculture	The ReConnect Program offers loans, grants, and loan-grant combinations to facilitate broadband deployment in areas of rural America that currently do not have sufficient access to broadband.	ReConnect Round 5* (TBA)	

Disclaimer: Funding Opportunities

*The specific dates for the distribution of funding opportunities have not been finalized by the pertinent entities at this time.

7.1.2 Affordable Connectivity Program (ACP)

Under the terms of the ACP, an eligible household that signs up for the program will receive a discount of up to $30/month on any internet service plan a participating provider offers. The ACP is the largest high-speed internet affordability program in our nation's history.

Under the terms of the ACP, an eligible household that signs up for the program will receive a discount of up to $30/month on any internet service plan a participating provider offers. It is estimated that 48 million households—or nearly 40% of households in the country—qualify for the ACP based on the following eligibility criteria:

- Supplemental Nutrition Assistance Program (SNAP), formerly known as Food Stamps
- Medicaid
- Special Supplemental Nutrition Program for Women, Infants, and Children (WIC)
- Supplemental Security Income (SSI)
- Federal Public Housing Assistance (FPHA)
- Veterans Pension and Survivors Benefit
- Free and Reduced-Price School Lunch Program or School Breakfast Program, including at U.S. Department of Agriculture (USDA) Community Eligibility Provision schools
- Federal Pell Grant (received in the current award year)
- Lifeline
- Certain Tribal assistance programs, including Bureau of Indian Affairs General Assistance, Head Start (only households meeting the income qualifying standard), Tribal Temporary Assistance for Needy Families (Tribal TANF), and Food Distribution Program on Indian Reservations
- Meets the eligibility criteria for a participating broadband provider's existing low-income internet program.

In January of 2024, the FCC announced the wind-down of the Affordable Connectivity Program without further funding and Congressional action, this program is projected to run out of funds by April 2024. New enrollments for the program ended on February 7, and wind-down steps are being taken to ensure that households are notified about the end of the program. Program recipients will continue to receive their benefit through April 2024. It is recommended that national and local representatives, organizations, and internet providers look into creating long-term low-cost options to replace the reduced benefits.

Other federal programs that recipients might qualify for to save on internet service is the Lifeline Program, another federal program that gives monthly benefits for phone and internet service. Lifeline is dedicated to making phone and internet service more affordable for low-income households. This benefit provides eligible consumers with a monthly discount of up to $9.25. Consumers living on Tribal lands are eligible for an enhanced discount of up to $34.25 per month. Households can qualify for Lifeline if household income is up to 135% of the Federal Poverty Guidelines or if someone in the household participates in certain federal assistance programs like SNAP and Medicaid.[17]

[17] Federal Communications Commission. https://www.fcc.gov/sites/default/files/ACP_Wind-down_Lifeline_Fact_Sheet%20.pdf Accessed February 2024.

Eligibility for Lifeline includes:

- Participation in Federal Assistance Programs:
  - Medicaid
  - SNAP
  - Supplemental Security Income (SSI)
  - Federal Public Housing Assistance (FPHA), including Housing Choice Voucher (HCV) Program (Section 8 Vouchers), Project Based Rental Assistance (PBRA)/Section 202/Section 811, Public Housing, Affordable Housing Programs for American, Alaska Natives or Native Hawaiians
  - Veterans Pension and Survivors Benefit
- Household income is at or below 135% of the Federal Poverty Guidelines.

7.2 Bank and Community Development Financial Institution Partners

The following tables includes potential Bank and Community Development Financial Institution (CDFI) partners that have regulatory commitments to invest in the community under the federal Community Reinvestment Act (CRA) with philanthropic grants and financing. The CRA is a federal law that was passed in 1977 to address redlining, specifically the denial of credit and financial services to people of color and low-income communities. The CRA incentivizes banks to make loans, investments, and provide services (Lending, Service, and Investment) in low- and moderate-income (LMI) communities and middle income or LMI rural communities and tribal communities.

In 2016 the CRA was expanded to include broadband as a form of infrastructure investment, and the guidance declared that broadband is an essential community service like water and electricity. In addition, under the updated CRA service test, banks are required to show evidence that their "alternative delivery systems" using online banking and financial technology are being adopted and are effective in providing services to LMI individuals.

Digital equity was also included in the updated guidance that includes supporting workforce development, and specifically digital skills, preparing workers for the digital economy, and closing the homework gap. Small Business Development was already a significant part of CRA; thus, the regulators added examples to include supporting small businesses in the use of technology and online platforms.
Bank broadband financing opportunities include:

- Construction financing, working capital, and short-term bridge loans
- Permanent financing through the U.S. Small Business Administration 7(a) loans, USDA RD Community Facilities, & Office of Indian Energy and Economic Development Programs
- New Markets Tax Credits (NMTC)
- Equity Investments
- Capital stacks can include a bank low-interest loan, a philanthropic grant, and other sources.
- Affordable Housing projects, Low-income Housing Tax Credit (LIHTC) projects that include broadband infrastructure.
- Grants to non-profit entities, schools, community health centers for broadband infrastructure and digital inclusion programs, i.e., digital workforce development programs; high speed connectivity, digital skills and computers/applications for the digitalization of small businesses in the digital economy, building community financial education for mobile and online banking, internet safety and security, and expanding networks and programs to support telehealth.
- Bank grant or equity contributions to a non-profit community development loan fund for the purpose of financing broadband expansion in LMI and rural areas.
- An example of a bank grant for broadband and digital equity is the PNC (BBVA) Bank's contribution to fund the Broadband Engineering and Feasibility Studies for Pharr (including San Juan and Alamo). The bank also contributed computers for the families in their pilot program.

Additional notes on the option for New Markets Tax Credits (NMTC) Financing

- The NMTC is administered by the CDFI Fund in U.S. Treasury
- Broadband was included as an area of investment for NMTC in 2016
- The program started in 2000 to spur economic development and job creation in low-income census tracts and became an important CRA tool.
- A Community Development Entity (CDE) (can be banks, credit unions, CDFIs) can apply for NMTCs
- Over the last 20+ years, CDEs have developed expertise in identifying projects that meet CDFI Fund's project criteria:
    - Strong community impact
    - Local companies
    - Job creation/enablement/retention
    - Workforce Training for the jobs that will be created
    - Projects in rural communities in targeted states and other underserved states.
- The NMTC Program provides a 39% tax credit that is monetized by CDEs that find investors to provide loans to projects that are awarded the NMTCs
- Investors provide upfront discounted loans that account for the tax credit.
- The outcome is loans at 1-2% interest that result in a reduction in project cost of up to 20% on a $10 mm project.
- For a $10M project, the qualified entity would have to borrow/raise $8M (20% reduction)
- Ryan Consulting in Dallas TX has worked with several CDEs to successfully finance broadband projects
- Community Broadband Action Network webinar, NMTC for Broadband, can be viewed at the link
    - https://youtu.be/-JCi74G8N2c

Table 18: Federal Based Funding Opportunities

Grant Type	Grant	Qualifying Program	Contact Person	Submission Date
Federal	EDA STEM Talent Challenge	Digital Workforce	Jorge Ayala (Regional Director for EDA's Austin Office)	2024 Date: TBD
Federal	USDA (various) - eg. Rural Development: Broadband Technical Assistance	Infrastructure, Digital Workforce, Telehealth, Broadband Planning, precision agriculture/smart rural		2023 Date: Jun. 20; 2024 2024 Date: TBD
Federal	US Department of Labor (DOL) - Building Pathways to Infrastructure Jobs	Digital Workforce		2023 Date: Jul. 7; 2024 2024 Date: TBD
Federal	EDA TechHubs	Digital Workforce	Expanding Frontiers (nonprofit), Aerospace Workforce, RGV-Cameron County lead applicant in partnership with Workforce Solutions Hidalgo	2023 Date: Aug. 15; 2024 Date: TBD
Federal	EDA RECOMPETE, Distressed Communities	Digital Workforce	UTRGV Main Applicant	Oct. 5, 2023 Phase 1 Planning and Qualifying; approx. Jan. 2024 for Phase 2 Multi-year Funding
Federal	US Health and Human Services (various)	Public Health, Telehealth		

Table 19: NonProfit and Philanthropic Based Funding Opportunities

Grant Type	Grant	Qualifying Program	Contact Person	Submission Date
Nonprofit Lender and Broadband Policy	Connect Humanity Fund	Community Broadband Financing and Planning Grants	Chris Worman and Jordana Barton-Garcia	
Philanthropy	Valley Baptist Legacy Foundation	Health Equity, Digital Equity, Social Determinants of Health	Judy Quisenberry	LOI- Sept. 2023, Grant due Nov 2023
Philanthropy	Hispanics in Philanthropy		Ana Marie Argilagos	
Philanthropy	Methodist Healthcare Ministries of South TX	Broadband Infrastructure and Digital Equity, Health Equity, Social Determinants of Health	Charito Lincoln and Monica Gonzalez	
Philanthropy	Texas Rural Funders		Kelty Garbee	
Philanthropy	Ford Foundation	Digital Workforce and the Digitalization of Small Business	Chance Williams (Program Officer/Technology & Society)	Provided the seed funding for the Connect Humanity South TX Small Business Broadband Fund for the Digitalization of Small Business

Table 20: Bank Based Funding Opportunities

Grant Type	Grant	Qualifying Program	Contact Person	Submission Date
Bank-CRA	Lonestar Natonal Bank	Grants, financing, New Markets Tax Credits	Julian Alvarez (SVP)	
Bank-CRA	Capital One	Grants, financing, New Markets Tax Credits	Stacey Cooper, Lakia Williams, and Jessa Thomas	
Credit Union-CDFI	South Texas Federal Credit Union	Grants, financing, New Markets Tax Credits		Received Funds from US Treasury CDFI Fund for Investing in Low-income communities in the RGV and eliminating poverty
Bank-CRA	Plains Capital Bank	Grants, financing, New Markets Tax Credits		
Bank-CRA	Citi	Grants, financing, New Markets Tax Credits	Chelsea Cruz (NYC office)	
Bank-CRA	Chase	Grants, financing, New Markets Tax Credits	Yvett Ruiz Krumhansl (VP Community Engagement) and Vince Toye (Head of Community Development Banking)	
CDFI/Bank-CRA	Rio Financial Services (Rio Bank)	Grants, financing, New Markets Tax Credits		Received Funds from US Treasury CDFI Fund for Investing in Low-income communities in the RGV and eliminating poverty
CDFI/Bank-CRA	MNB Ventures (Texas National Bank)	Grants, financing, New Markets Tax Credits	Joe Quiroga (President and Director)	Received Funds from US Treasury CDFI Fund for Investing in Low-income communities in the RGV and eliminating poverty
Bank-CRA	PNC Bank	Grants, financing, New Markets Tax Credits	Ray Ocanas and Yolanda Davila	
CDFI/ Bank-CRA	AOB Ventures (Freedom Bank)	Grants, financing, New Markets Tax Credits	Arturo Ortega (President and Director)	Received Funds from US Treasury CDFI Fund for Investing in Low-income communities in the RGV and eliminating poverty
Bank-CRA	Frost Bank	Grants, financing, New Markets Tax Credits	Donna Normandin and Jose Aleman	

7.3 Rio Grande Valley Broadband Coalition

Note: This section is repeated from the Public Outreach section covering Stakeholder Engagement, as the RGV Broadband Coalition impacts both aspects of this report.

The RGV Broadband Coalition, comprised of various organizations including the LRGDVC, local governments, educational institutions, and businesses such as VTX1 Companies and Lone Star National Bank, has been tasked with devising a comprehensive regional broadband strategy in the Rio Grande Valley. This collaborative effort spans a diverse array of stakeholders, including community advocacy groups like La Union Del Pueblo Entero (LUPE), with an aim to address broadband accessibility issues in the Cameron, Hidalgo, Starr, and Willacy counties. As the initiative progresses, additional partners will be incorporated into the coalition, broadening its reach to enhance broadband connectivity across the region.

7.3.1 RGV Broadband Coalition Programs[18]

Regional Expansion of High-Speed Broadband Infrastructure And Affordable Service:

Efficiency in deploying high-speed networks will be achieved with city and county government broadband engineering and feasibility studies and partnerships with local Internet Service Providers (ISPs) and anchor institutions.

Cameron County, City of Brownsville, City of Pharr, City of Harlingen, City of San Juan, and the City of Alamo have completed, or are currently underway (City of Mercedes), with their broadband feasibility studies. This Hidalgo County feasibility study will also be used for consideration.

Methodist Healthcare Ministries provided a $1 million grant to support the City of Pharr's municipal broadband utility, TeamPharr.Net. Valley Baptist Legacy Foundation provided a $191,000 grant to connect Harlingen Housing Authority residents with high-speed broadband in a partnership with Spectrum.

Total cost for RGV infrastructure expansion TBD.

Level Up RGV Digital Workforce Programs: Broadband Network Design-Build- Maintenance;

Community Digital Navigators/Digital Citizenship; Information Technology (IT); Cybersecurity; Telecommunications & Information Technology Policy and Law. All training/degree/certification programs include paid internships/apprenticeships, professional development and customer service skills. The RGV Digital Workforce Team, under the RGV Broadband Coalition, has followed NTIA's Workforce Planning Guide, in identifying existing programs to expand and gaps in workforce preparation to incorporate new career credentials and experiential learning.

$125,000 planning grant from Rural LISC to IDRA to facilitate the RGV Broadband Coalition's Digital Workforce Working Group. Total cost of the program TBD.

[18] Barton-Garcia, J., & Cruz, M. (2023). SOUTH TEXAS PROFILE: The Rio Grande Valley (RGV) Broadband Coalition [Review of SOUTH TEXAS PROFILE: The Rio Grande Valley (RGV) Broadband Coalition].

Expanding Broadband Access and Digital Skills for Civic Participation:

A train-the-trainer program designed and led by La Union del Pueblo Entero (LUPE), ARISE Adelante, IDRA, Rural LISC, and CDCB, to teach Colonia and other underserved residents digital skills through an interactive digital navigator program to apply their digital skills for community-organizing to advocate for human rights, educational equity, U.S. Census participation, access to infrastructure and safe housing, and more.

$50,000 grant from Connect Humanity ($25,000 each) for LUPE and ARISE to plan the digital navigator program as part of the Level Up RGV Digital Workforce Planning. Annual cost of the program TBD.

South Texas Small Business Broadband Fund:

A partnership for the RGV Region between Connect Humanity, the City of Pharr/TeamPharr.Net, Region One ESC, VTX1 Companies, SmartCom, BTX Fiber, Workforce Solutions Cameron, and Workforce Solutions (Starr, Hidalgo, Willacy) to address broadband affordability for high-speed internet, digital tools/platforms, and digital skills (digitalization) for microenterprise and small business, and nonprofits/community health centers.

$200,000 grant from the Ford Foundation to Connect Humanity. Total investment required, $10 million.

RGV Strategic Telehealth Expansion Plan:

A partnership between local governments, including the City of Pharr and Brownsville, local ISPs, Methodist Healthcare Ministries, Valley Baptist Legacy Foundation, University of Texas Rio Grande Valley Medical School, La Union Del Pueblo Entero, community health clinics, and nonprofits to ensure health care providers have necessary internet speed and capacity and that they collaborate with ISPs to connect communities and Colonias to provide robust telehealth services.

$75,000 Telehealth planning grant from Methodist Healthcare Ministries for the City of Brownsville. Total cost of the regional expansion TBD.

APPENDIX

8 APPENDIX 1 - ACRONYMS

ACRONYM	MEANING
ACP	Affordable Connectivity Program
ADSL	Asymmetric Digital Subscriber Line
AMR	Automatic Meter Reading System
ARPA	American Rescue Plan Act
BDC	Broadband Data Collection
BDO	Broadband Deployment Office
BEAD	Broadband Equity, Access, And Deployment
BIPOC	Black, Indigenous and People of Color
BOM	Bill Of Materials
BOOT	Bringing Online Opportunities to Texans
BOT	Build Operate Transfer
CAF	Connect America Funds
CBRS	Citizens Broadband Radio Service
CDCT	Cloud+ Data Center Transformation
CDE	Community Development Entity
CDFI	Community Development Financial Institution
COG	Council Of Governments
CRA	Community Reinvestment Act
DDoS	Distributed Denial-Of-Service
DOL	US Department of Labor
EBB	Emergency Broadband Benefit Program
EMS	Emergency Medical Services
EOC	Emergency Operations Centers
ESC	Education Service Center
FCC	Federal Communications Commission
FPHA	Federal Public Housing Assistance
FTTH	Fiber To The Home
FTTP	Fiber To The Premise
FTTx	Fiber to the x
Gb	Gigabit
Gbps	Gigabits Per Second
GDP	Gross Domestic Product
GIS	Geographic Information Systems
GLO	General Land Office
GPON	Gigabit Passive Optical Networks
HDPE	High-Density Polyethylene
HLD	High-Level Design
IDRA	Intercultural Development Research Association

ISD	Independent School District
ISP	Inside Plant Implementation
ISP	Internet Service Providers
IT	Information And Technology
KMZ	Keyhole Markup Language Zipped
LEA	Local Education Agency
LIHTC	Low-income Housing Tax Credit
LISC	Local Initiatives Support Corporation
LMI	Low- And Moderate-Income
LRGDVC	Lower Rio Grande Valley Development Council
LTE	Long-Term Evolution
LUPE	La Unión Del Pueblo Entero
MAN	Metropolitan Area Network
Mb	Megabit
Mbps	Megabits Per Second
MGI	McKinsey Global Institute
MPLS	Multi-Protocol Label Switching
NG911	Next Generation 911
NMTC	New Markets Tax Credits
NTIA	National Telecommunications And Information Administration
OECD	Economic Co-Operation And Development
OOM	Order Of Magnitude
OSP	Outside Plant Implementation
OSS/BSS	Operations And Business Support Systems
PALs	Priority Access Licenses
PON	Passive Optical Networks
POP	Points Of Presence
PPP	Public-Private Partnerships
PSAP	Public-Safety Answering Point
PWI	Public Welfare Investments
QoS	Quality Of Service
RDOF	Rural Digital Opportunity Fund
RFI	Request For Information
RFP	Request For Proposals
RFQ	Request For Qualifications
RGV	Rio Grande Valley
ROI	Return On Investment
ROW	Right Of Way
SETG	Southeast Texas GigaPOP
SHR	Self-Healing Ring
SNAP	Supplemental Nutrition Assistance Program

SSI	Supplemental Security Income
TAGITM	Texas Association of Governmental Information Technology Managers
Tribal TANF	Tribal Temporary Assistance For Needy Families
TSLN	The Texas Lone Star Network
TXDOT	TXDOT Department Of Transportation
UAR	Utility Accommodation Rules
USAC	Universal Service Administrative Company
USDA	United States Department Of Agriculture
VPN	Virtual Private Network
WIC	Women, Infants, And Children
WISP	Wireless Internet Service Providers

9 APPENDIX 2 - GLOSSARY OF TERMS

(Sourced from Broadband.Money[19] and NTIA[20])

0-9	
3G	The term for the 3rd generation wireless telecommunications standards usually with network speeds of less than 1 Mbps
4G	The term for 4th generation wireless telecommunications standards usually with network speeds greater than 1 Mbps.
5G	The term for emerging 5th generation wireless telecommunications standards usually associated with network speeds of up to 1 Gbps or more
63-20 Financing	In Revenue Ruling 63-20 the IRS ruled that, in certain circumstances, bonds issued by a nonprofit corporation (the "Nonprofit") will be considered issued on behalf of a Governmental Unit – thus allowing the interest on such bonds to be eligible for tax-exempt treatment. A 63-20 financing may help avoid certain political and legal hurdles that otherwise might be present if the Governmental Unit were to issue the bonds directly.
A	
Aerial Installation	A type of fiber optic cable that is usually used for outside installation on poles. Due to its installation environment, the design of aerial fiber optic cable must consider how to protect it from destruction by nature or man-made damage.
Affidavit	A written declaration or statement that is sworn or affirmed before a person who has authority to administer an oath. Affidavits verify the legitimacy of a claim and are used in conjunction with witness statements or other related evidence in a dispute or a criminal matter. The person who signs the affidavit must be personally aware of the facts contained within, and he or she must swear that the affidavit is 100% true.
Affordable Connectivity Program (ACP)	Under the Infrastructure Investment and Jobs Act, the previous Emergency Broadband Benefit Program has been renamed the Affordable Connectivity Program. Although the program's benefit has been lowered from $50/month to $30/month, the definitions and operative terms of the program remain intact. Under those definitions, an Affordable Connectivity offer is one that is affordable for four-person household that includes two dependents under age 18 and has an income 136% of poverty line. IIJA Section 60502, "Broadband Affordability". For white-labeled, turnkey ACP automation, please contact Ready.
Asymmetric	When the upload and download speeds do not match. A rate of 10 Mbps down/1 Mbps up would be asymmetric.
Asymmetrical Digital Subscriber Line (ADSL)	A form of Internet service communications technology that delivers constantly accessible data transmissions over copper telephone lines.

[19] Glossary of Broadband Grant Terms. Broadband.money. https://broadband.money/broadband-grant-terms. Published 2022. Accessed June 1, 2022.
[20] Broadband Glossary. Broadbandusa.ntia.doc.gov. https://broadbandusa.ntia.doc.gov/sites/default/files/publication-pdfs/bbusa_broadband_glossary.pdf. Published 2022. Accessed June 1, 2022.

	ADSL is a common brand of DSL and has download speeds between 2 and 6 Mbps and upload speeds reaching 512 Kbps.
Asynchronous Transfer Mode (ATM)	A transmission method where information is re-structured into cells. It is asynchronous due to the fact that the recurrence of cells from an individual user is not necessarily periodic.
Attestation	The process for scrutinizing the authenticity of a document by corroborating every detail given on it and then manifesting it authentic with the sign and stamp of verifying personnel on it.
Average Revenue Per User (ARPU)	The term is used by companies that offer subscription services to clients. It is a measure of the revenue generated by one subscriber per unit time, typically per year or month. It is a particularly useful measurement for companies in the telecommunications industry, which relies on subscribers or users.
B	
BEAD Timelines	Eligible entities decide whether to participate in the BEAD program, which will provide ~$42B for infrastructure planning and implementation. If they choose to, they need to submit a letter of intent to NTIA by the deadline. To read in more details about the multitude of deadlines for the BEAD program, as well as any newly established deadlines from the National Telecommunications and Information Administration themselves, refer to our Timeline of Key Milestones and Grant Application Deadlines.
Backbone	The Internet is really a network of networks, and the large trunk lines that connect them are referred to as the “backbone.” It can also be thought of as being like the highway system: the interstate highways are the backbones that connect regions that have highway networks of their own.
Bandwidth	In the world of Internet service, bandwidth has come to mean the speed of Internet service, measured in bits per second. Not to be confused with bandwidth referring to a range of radio wave frequencies, which may be used in more technical discussions about how data is transferred.
Bank Loan	An amount of money loaned at interest by a bank to a borrower, usually on collateral security, for a certain period of time.
Bit	A bit is the basic unit of information in computing. The name comes from “binary digit,” and each bit has one value, either 1 or 0, or on and off. It usually takes eight bits to represent one character of text; a group of eight bits makes a byte. Data file sizes are measured in bytes while data speed is measured in bits.
Broadband	Shorthand term for any high-speed Internet access that is faster than dial-up and, unlike dial-up, is always on. Over the years, as what it is used for the Internet that has demanded a larger capacity for moving data, different entities have set speed definitions for broadband, implying that an Internet-access service shouldn’t be called “broadband” or “high-speed” unless it meets a certain speed level.
Broadband Deployment Accuracy And Technological Availability (DATA) Act	Passed on March 10, 2020, just prior to the significant shutdown occasioned by the coronavirus pandemic, the Broadband Deployment Accuracy and Technological Availability (DATA) Act established new guidelines and rules for the Federal Communications Commission's production of broadband availability and deployment maps. The rules effectively require an address-by-address inventory of broadband. These requirements are codified at 47 U.S.C. Section 642.

Broadband Deployment Accuracy And Technological Availability (DATA) Act Maps	Under the Infrastructure Investment and Jobs Act, funding eligibility for areas that are "Unserved" and "Underserved" will be determined by reference to the Broadband DATA Maps created under the Broadband DATA Act. IIJA, Section 60103.
Broadband Equity, Access And Deployment Program (BEAD) Program	A $42.45B formula grant program directed towards states and territories with the objective of closing the availability gap, as Congress finds that "access to affordable, reliable, high-speed broadband is essential to full participation in modern life in the United States."
Broadband Initiatives Program (BIP)	The Broadband Infrastructure Program is a $288 million broadband deployment program directed to partnerships between a state, or one or more political subdivisions of a state, and providers of fixed broadband service to support broadband infrastructure deployment to areas lacking broadband, especially rural areas.
Broadband Technology Opportunities Program (BTOP)	The Broadband Technology Opportunities Program (BTOP) is an approximately $4 billion grant program administered by NTIA to help bridge the technological divide; create jobs; and improve education, health care, and public safety in communities across the country. Funded by the American Recovery and Reinvestment Act of 2009, BTOP projects are deploying broadband Internet infrastructure, enhancing and expanding public computer centers, and encouraging the sustainable adoption of broadband service.
Buried Fiber Deployment	Buried fiber deployments are buried below the layer where the soil freezes so they are immune to wind and ice damage. This means that underground deployments are often more reliable than aerial routes, especially where poor weather is common.
Burstable	Authorizes a connection to exceed its specified speed, normally up to a set maximum capacity for a period of time.
Burst Speed	A method which momentarily allots additional bandwidth to consumer's services for short periods of time.
Byte	A unit of digital information that most commonly consists of eight bits. Historically, the byte was the number of bits used to encode a single character of text in a computer and for this reason it is the smallest addressable unit of memory in many computer architectures.
C	
Cable	A category of broadband Internet access that uses the infrastructure of cable TV network to provide Internet services. Cable Internet provides connectivity from the Internet service provider (ISP) to the end users in a similar manner as digital subscriber line (DSL) and fiber-to-the-home (FTTH).
Capital Expenditures (Capex)	A category of broadband Internet access that uses the infrastructure of cable TV network to provide Internet services. Cable Internet provides connectivity from the Internet service provider (ISP) to the end users in a similar manner as digital subscriber line (DSL) and fiber-to-the-home (FTTH).
Capital Structure	The structure of all capital that is invested into a company. At a high level, this means that the capital stack includes both the equity and the debt invested to date. More specifically, though, this means all types of both equity and debt. That means both common and preferred equity, and both junior and senior debt. These categories can be further split. You can have different types of preferred equity, for example.

Census Block	The smallest geographic area for which the Bureau of the Census collects and tabulates decennial census data. Generally small in area. In a city, a census block looks like a city block bounded on all sides by streets. Census blocks in suburban and rural areas may be large, irregular, and bounded by a variety of features, such as roads, streams, and transmission lines. In remote areas, census blocks may encompass hundreds of square miles. Census blocks are grouped into block groups, which are grouped into census tracts.
Challenge Process	The process of grant applicants engaging communities they intend to serve, and the right of refusal held by communities for broadband grant applications. Each Eligible Entity shall develop and describe in the Initial Proposal, a transparent, evidence-based, fair, and expeditious challenge process under which a unit of local government, nonprofit organization, or broadband service provider can challenge a determination made by the Eligible Entity in the Initial Proposal as to whether a particular location or community anchor institution within the jurisdiction of the Eligible Entity is eligible for grant funds.
Churn	Churn rate, sometimes known as attrition rate, is the rate at which customers stop doing business with a company over a given period of time. Churn may also apply to the number of subscribers who cancel or don't renew a subscription. The higher your churn rate, the more customers stop buying from your business.
Coax	A type of cable used to transmit data, the internet, video and voice communications. A coax cable is made up of an aluminum and copper shield with an outer plastic jacket with the dielectric insulator helping to minimize signal loss.
Common Equity	The amount that all common shareholders have invested in a company. Most importantly, this includes the value of the common shares themselves. However, it also includes retained earnings and additional paid-in capital.
Communications Act Of 1934	Signed into law by Franklin D. Roosevelt, the Communications Act of 1934 created a unified regulatory system for communications. Among other things, it created the Federal Communications Commission, which replaced the Federal Radio Commission, and took over the regulation of interstate telephone services from the Interstate Commerce Commission. The central principle of the act was that a comprehensive nationwide communications system “with adequate facilities at reasonable charges” was good for the country.
Community Anchor Institution (CAI)	An entity such as a school, library, health clinic, health center, hospital or other medical provider, public safety entity, institution of higher education, public housing organization, or community support organization that facilitates greater use of broadband service by vulnerable populations, including, but not limited to, low-income individuals, unemployed individuals, children, the incarcerated, and aged individuals.
Conduit Financing	A means for private companies, nonprofit organizations (NPO), and public entities to raise capital via tax-exempt municipal bonds to fund large-scale projects that typically benefit the general public. Such projects can include

	hospitals, airports, industrial and housing projects, public facilities, and schools.
Connect America Fund (CAF)	The Connect America Fund was unveiled in 2011 as part of the Universal Service Fund, redesigned to help fund Internet infrastructure in the nation's high-cost areas. CAF put a new emphasis on Internet service.
Connecting Minority Communities Pilot Program (CMC) Pilot Program	The Connecting Minority Communities Pilot Program is a $268 million NTIA grant program to Historically Black Colleges and Universities (HBCUs), Tribal Colleges and Universities (TCUs), and Minority-Serving Institutions (MSIs) for the purchase of broadband internet access service and eligible equipment or to hire and train information technology personnel. The CMC grant program was established by the Consolidated Appropriations Act of 2021 to support MSIs and their surrounding communities.
Consolidated Appropriations Act Of 2021	The Consolidated Appropriations Act of 2021 created the $980 million program to provide grants to expand regular and remote broadband access and adoption by Tribal entities, the $268 million Connecting Minority Communities Pilot Program, and the Emergency Broadband Benefit.
Content Provider	A website or organization that handles the distribution of online content such as blogs, videos, music or files.
Co-Op	Also Known As: Co-Op - An autonomous association of persons united voluntarily to meet their common economic, social, and cultural needs and aspirations through a jointly owned enterprise. Cooperatives are democratically owned by their members, with each member having one vote in electing the board of directors.
Customer Premises Equipment (CPE)	Refers to any piece of connected equipment that is used for accessing the Internet or generally accessing services on a provider network, whether directly or indirectly connected to that network. CPE can be provided by the telecommunications provider, such as a cable operator, telephone company or satellite provider. These companies either rent this equipment to the customer, provide it at no charge as part of the service, or allow a customer to purchase and provide their own equipment.
D	
Dark Fiber	Fiber that is in place but not being used for broadband services. ("non-lit" fiber, also see "Lit Fiber").
Data Packet	Data is sent over the Internet as packets. One file is divided into many packets when it is sent, then reassembled into one file again at its destination. Using packets allows data to travel much faster since the individual packets are smaller than the original file and can travel separately over different routes before reassembling.
Debt	Debt is an obligation that requires one party, the debtor, to pay money or other agreed-upon value to another party, the creditor. Debt is a deferred payment, or series of payments, which differentiates it from an immediate purchase.
Debt/EBITDA	A ratio measuring the amount of income generated and available to pay down debt before covering interest, taxes, depreciation, and amortization expenses. Debt/EBITDA measures a company's ability to pay off its incurred debt.

Demand Point Passed (DPP)	Total number of active and potential subscribers that an ISP's network could service.
Digital Divide	The Digital Divide, or Digital Canyon, is the gap between people who have access to affordable, reliable Internet service (and the skills and gadgets necessary to take advantage of that access) and those who lack it.
Digital Equity	Recognizes that digital access and skills are now required for full participation in many aspects of society and the economy. Digital Equity links Digital Inclusion to social justice and highlights that a lack of access and/or skills can further isolate individuals and communities from a broad range of opportunities.
Digital Inclusion	Implies that individuals and communities have access to robust broadband connections; Internet enabled devices that meet their needs; and the skills to explore, create and collaborate in the digital world.
Digital Literacy	The ability to leverage current technologies, such as smartphones and laptops, and Internet access to perform research, create content and interact with the world.
Digital Skills	Any skills related to operating digital devices or taking advantage of digital resources.
Digital Subscriber Line (DSL)	A group of technologies used to transmit data over telephone lines. DSL made high-speed Internet access possible for ordinary consumers without having to do a great deal of rewiring. "ADSL" stands for asymmetric digital subscriber line, meaning the data travels downstream and upstream at different rates.
Data Over Cable System Interface Specification (DOCSIS)	The international telecommunications standard for cable signaling data and spectrum sharing.
E	
Earnings Before Interest Taxes Depreciation And Amortization (EBITDA)	A company or project's earnings before interest, taxes, depreciation, and amortization is a measure of a company's profitability of the operating business only, thus before any effects of indebtedness, state-mandated payments, and costs required to maintain its asset base.
Economic Development Incentive	An array of benefits designed to promote new business activity or to encourage business or job retention. These benefits principally encompass tax and economic incentives provided by federal, state, or local governmental bodies. Other entities, such as utilities and non-profits, can also make incentives available for these purposes. They accord the recipient, in some manner, a monetary benefit (i.e., tax incentives) or an in-kind benefit (e.g., state regulatory releases of environmental liability, municipal/County infrastructure improvements).
Eligible Community Anchor Institution	A Community Anchor Institution that lacks access to gigabit-level broadband service. IIJA, Section 60102.
Eligible Entity	Under the Infrastructure, Investment and Jobs Act, an "eligible entity" is a state, a territory, the District of Columbia, or an eligible Tribal entity. IIJA, Section 60102.
Enterprise Value (EV)	A measure of a company's total value. It is a combination of the value of common stock, preferred stock, cash, and debt. Determining the value of public companies is much easier than private companies which don't make their financials available to the public. You can use the comparable company analysis approach, which involves looking for similar public companies. Using findings from a private company's closest public

	competitors, you can determine its value by using the EBITDA or enterprise value multiple.
Equity	The value that would be returned to a company's shareholders if all of the assets were liquidated and all of the company's debts were paid off. Equity financing involves selling a stake in your company or project in return for a cash investment. Unlike a loan, equity finance doesn't carry a repayment obligation. Instead, investors buy shares in the company in order to make money through dividends (a share of the profits) or by eventually selling their shares.
F	
FCC Registration Number (FRN)	The FCC Registration Number (FRN) is a 10-digit unique identifying number that is assigned to entities doing business with the Federal Communications Commission. The FRN is obtained through the Commission Registration System (CORES).
Feasibility Study	An analysis that considers all of a project's relevant factors—including economic, technical, legal, and scheduling considerations—to ascertain the likelihood of completing the project successfully.
Federal Communications Commission (FCC)	The FCC was created by the Communications Act of 1934 and today regulates "interstate communications by radio, television, wire, satellite, and cable in all 50 states, the District of Columbia and U.S. territories."
Fiber	A fiber optic cable is made up of bundles of hair-thin strands of very pure glass or plastic. Data passes over them in the form of light pulses created by lasers. Because of the purity of the glass or plastic, data can travel much farther and faster on fiber than on copper wires with much less loss of data.
Fiber-To-The-Curb (FTTC)	The installation and use of optical fiber cable directly to curbs near homes or businesses. Coaxial cable or another medium carry signals the short distance from the curb to the home or business. As such, this system is inexpensive to employ. The basic idea of fiber to curb technology is that suitable wires can carry high-speed signals at short distances. The twisted wire pairs or coaxial cables have acceptable bandwidth loss while sending signals only a few hundred feet. Also known as integrated fiber in the loop (IFITL).
Fiber-To-The-Home (FTTH)	Equipment used in fiber access deployments where fibers extend all the way to the end-user premises and the equipment is designed and optimized for use in residential applications.
Fiber-To-The-Node (FTTN)	Equipment used in fiber access deployments where fibers extend to the network connection point/box/node in a neighborhood and no farther.
Fiber-To-The-Premises (FTTP)	The installation and use of optical fiber from a central point directly to individual buildings such as residences, apartment buildings and businesses to provide high-speed internet access.
Fixed Wireless Broadband Access	The use of wireless devices/systems in connecting two fixed locations, such as offices or homes. The connections occur through the air, rather than through fiber, resulting in a less expensive alternative to a fiber connection.
Formula Grant	A United States federal grant specifying a precise formula in the legislation creating the program. Formula grants include quantifiable elements, such as population, amount of tax effort, proportion of

	population unemployed or below poverty level, density of housing, or rate of infant mortality.
G	
General Obligation (GO) Bond	A municipal bond backed solely by the credit and taxing power of the issuing jurisdiction rather than the revenue from a given project. General obligation bonds are issued with the belief that a County will be able to repay its debt obligation through taxation or revenue from projects. No assets are used as collateral.
Grant Adjusted Yield On Cost (YOC)	The percentage an unlevered broadband project pays out per year in EBITDA based on the initial cost of the project, but the grant is subtracted from total project cost.
Grant Anticipation Note (GAN)	Short-term municipal financing issued in anticipation of receiving a grant from the federal government or one of its agencies.
Gross Profit Margin	The net sales less the cost of goods sold (COGS). In other words, it's the amount of money a company retains after incurring the direct costs associated with producing the goods it sells and the services it provides. The higher the gross margin, the more capital a company retains, which it can then use to pay other costs or satisfy debt obligations. Companies use gross margin, gross profit, and gross profit margin to measure how their production costs relate to their revenues. For example, if a company's gross margin is falling, it may strive to slash labor costs or source cheaper suppliers of materials. Alternatively, it may decide to increase prices, as a revenue-increasing measure. Gross profit margins can also be used to measure company efficiency or to compare two companies of different market capitalizations.
Guaranteed Bank Loan	A guaranteed loan is backed by a third party, and if the borrower defaults, the third party repays the loan.
H	
High Cost Area	A "high-cost area" is an Unserved area in which the head of the National Telecommunications and Information Administration determines that the cost of deploying broadband service is higher than the average cost of deploying broadband service to other Unserved areas. The head of NTIA has flexibility in making the determination, also considering: -the remote location of the area -the population density of the area -the unique topography of the area -a high rate of poverty -any other factor that contributes to the cost of deploying broadband service IIJA, Section 60102.
I	
Incumbent And Competitive Local Exchange Carriers (ILEC)	Before the Telecommunications Act of 1996, telephone companies operated as legal monopolies in defined territories of service, called exchanges. After the 1996 act and its emphasis on competition, these carriers became incumbent local exchange carriers in their operating territories. At the same time competing local exchange carriers were

	allowed to enter any territory, build their own infrastructure, and offer services.
Indefeasible Right Of Use (IRU)	The effective long-term lease (temporary ownership) of a portion of the capacity of an international cable. IRUs are specified in terms of a certain number of channels of a given bandwidth. IRU is granted by the company or consortium of companies that built the (usually optical fiber) cable. Some IRU legal agreements forbid resale of the capacity ownership. For at least one major international cable owner, an IRU ownership period is granted for 25 years. An IRU gives a large-scale Internet service provider (ISP) the ability to assure its own customers of international service on a long-term basis.
Industrial Development Bond (IRB)	Municipal debt securities issued by a government agency on behalf of a private sector company and intended to build or acquire factories or other heavy equipment and tools.
Infrastructure Investment & Jobs Act	Passed by the Senate on August 10, 2021, by the House of Representatives on November 5, 2021, and is expected to be signed into law by President Joe Biden on November 15, 2021, the Infrastructure Investment and Jobs Act (IIJA) is a landmark bipartisan bill providing $65 billion in funding for broadband infrastructure and deployment.
Inside Plant (ISP)	All cabling and equipment installed in a telecommunications facility.
Interconnection	The linking of numerous telecommunications networks to exchange user traffic.
Internet Protocol	The computer language that allows all the above-mentioned technologies to speak to each other. Before the invention of Internet protocol (IP), telephone networks could only transfer data on other telephone networks, cable networks on other cable networks and so on. IP makes the transfer of data technology-neutral, allowing networks everywhere to transfer data anywhere.
Internet Service Provider (ISP)	An organization that provides services for accessing, using, or participating in the Internet. Internet service providers can be organized in various forms, such as commercial, community-owned, non-profit, or otherwise privately owned.
L	
Last-Mile	The term that describes the last link connecting the provider's network to the customer's premises, either a house or a business. The Last Mile is the most expensive part of the network to build or upgrade because of the number of units involved. One fiber cable may be trenched down a street, but there may be twenty houses on the street that need to be connected. Upgrading the copper cable connection between each house and the fiber in the street would be the Last Mile. This last link can also be the reason customers often don't receive the level of Internet speed advertised by their provider. Since data travels more slowly on copper compared to fiber, when the data hits the copper, it slows down.
Latency/ Ping	The reaction time of your connection. How quickly your device gets a response after you've sent out a request. A low latency (fast ping) means a more responsive connection. Latency is measured in milliseconds (ms).

Letter Of Credit (LOC)	A letter from a bank guaranteeing that a buyer's payment to a seller will be received on time and for the correct amount. In the event that the buyer is unable to make a payment on the purchase, the bank will be required to cover the full or remaining amount of the purchase.
Limited-Tax General Obligation Pledge	Asks the issuing local government to raise property taxes if necessary to meet existing debt service obligations. However, this increase is bound by a statutory limit. With limited-tax general obligation pledges, governments can still use a part of already-levied property taxes, use another stream of income, or raise property taxes to an amount equating to existing debt service payments to answer its debt obligations.
Lit Fiber	An active fiber optic cable capable of transmitting data.
Loan	A type of credit vehicle in which a sum of money is lent to another party in exchange for future repayment of the value or principal amount. In many cases, the lender also adds interest and/or finance charges to the principal value which the borrower must repay in addition to the principal balance.
Local Area Network (LAN)	A group of network devices that are on a high-speed connection and typically within the same building or location.
Local Coordination	The process of grant applicants engaging communities they intend to serve, and the right of refusal among communities held by communities for broadband. Language in the local coordination component is going to drive community
Local Multipoint Distribution Service (LMDS)	A wireless broadband service that uses microwave signals to render communications service – voice, data, Internet – to customers within the Last Mile.
Low-Cost Broadband Service Option	Under the Infrastructure, Investment and Jobs Act, each state will submit to NTIA its own definition of a "low-cost broadband service option." Each state's definition shall apply to the award recipients that receive funds from the state in question. "Nothing in this title may be construed to authorize the Assistant Secretary or the National Telecommunications and Information Administration to regulate the rates charged for broadband service." IIJA Section 60102, subsection (h)(5)(D).
Long Term Evolution (LTE)	A 4G wireless broadband technology that provides speeds up to 100 Mbps download and 30 Mbps upload.
M	
Make Ready Work	Before an Internet Service Provider (or any company) can add a new attachment or line to a utility pole, the existing attachments may need to be moved around so that the pole can be made ready to handle a new attachment or line. This is known as 'Make Ready Work.' The reason Make Ready Work is necessary is that, under Federal Law, to prevent the risk of outages or other issues, lines on utility poles must be spaced a certain distance apart from each other based on how many lines are on the pole. Under federal guidelines, Make Ready Work must occur sequentially, meaning that attachments can only be moved in the order with which they were originally placed on the line. This process can create massive delays, as well as other large disruptions in high traffic areas, such as alongside major roadways. In addition, the make ready work can take months, or even years, to complete as every company involved must send out their own approved contractor to move only their respective

	attachment. Each contractor must also schedule their work to not conflict with other contractors performing Make Ready Work, as well as considering other local factors, such as weather, traffic, and maintenance work (such as road paving). These factors must be considered as the United States primarily uses aerial work platforms to perform Make Ready Work.
Match Funding	The portion of the project or program costs that are not paid by the funding agency. If the award is federal, only non-federal expenses qualify as cost sharing. Most broadband grant programs require between 25% to 50% matching capital. Common private match capital sources include equity, debt, and forward-receivables purchases. For more information about match capital including capital providers, see the Match Capital channel. Notes - Sub-grantees are required to provide a contribution of at least 25% derived from non-Federal funds (or funds from a Federal regional commission or authority), except in high-cost areas. Waivers to match can be granted at the discretion of NTIA. Eligible Sources - While most applicants will get their match capital from their own balance sheet, or through a combination of equity and / or debt investors, the match may also be provided by the State, a unit of local government, a utility company, a cooperative, a nonprofit organization, a for-profit company, regional planning or governmental organization, a Federal regional commission or authority, or an combination thereof. May include in-kind contributions and may include funds that were provided to an Eligible Entity or sub-grantee under: -Families First Coronavirus Response Act -The CARES Act -Consolidated Appropriations Act 2021 -The American Rescue Plan Act of 2021 -Any amendment made by an Act described above For definition, Federal regional commission or authority means: -Appalachian Regional Commission -Delta Regional Authority -Denali Commission -Northern Border Regional Commission
Mezzanine Debt	Any subordinated debt or preferred equity instrument that represents a claim on a company's assets which is senior only to that of the common shares. Mezzanine financings can be structured either as debt or preferred stock. Mezzanine debt bridges the gap between debt and equity financing and is one of the highest-risk forms of debt—being subordinate to pure debt but senior to pure equity.
Middle Mile/ Backhaul	The section of the network that connects the Last Mile portion of the network to the service provider's core network, where the services such as broadband, TV, and phone service originate from. More specifically, any broadband infrastructure that does not connect directly to an end-user location, including an anchor institution; and includes leased dark fiber, interoffice transport, backhaul, carrier-neutral internet exchange facilities, carrier-neutral submarine cable landing stations, undersea cables, transport connectivity to data centers, special access transport, and other

	similar services; and wired or private wireless broadband infrastructure, including microwave capacity, radio tower access, and other services or infrastructure for a private wireless broadband network, such as towers, fiber, and microwave links.
Millimeter Wave	Millimeter waves are also known as extremely high frequency (EHF). It's a radio frequency that would allow transmission frequencies between 30 GHz and 300 GHz, compared to 5 GHz frequencies used by previous mobile devices. It also has wavelengths between 1 mm and 10 mm, compared to the several-dozen centimeter wavelengths possessed by smartphones' current radio waves. At this point in time, millimeter waves are only used by radar systems like satellites. But mobile network providers have already started utilizing EHF in various ways, making it a new and promising approach. There are two ways to increase the speed of wireless data transmission. The first is increasing spectrum utilization. The second is increasing the spectrum bandwidth, often seen as a more simple and direct approach. That is the approach that millimeter waves would provide for 5G to increase transmission speeds.
Mobile	Mobile wireless Internet, accessed via smartphones. Data is transferred between cell phone towers, which are connected to the service provider by fiber.
Multiple Dwelling Unit	Residential duplexes, triplexes, fourplexes, apartment buildings, condominiums, mobile home parks, trailer courts, or similar types of multiple dwelling unit arrangements on one parcel of land.
Municipal Bond	A debt security issued by a state, municipality, or County to finance its capital expenditures, including the construction of highways, bridges, or schools. They can be thought of as loans that investors make to local governments. Municipal bonds are often exempt from federal taxes and most state and local taxes (for residents), making them especially attractive to people in higher income tax brackets.
N	
National Telecommunications And Information Administration (NTIA)	The National Telecommunications and Information Administration is an agency of the U.S. Department of Commerce. The NTIA resides within the Executive Branch of the federal government and is the president's principal advisor of telecommunications matters. By contrast, the Federal Communications Commission - the other agency with significant telecommunications- and broadband-related responsibilities - is an independent agency outside of the official purview of the White House. NTIA has existed since 1978 and has numerous communications responsibilities. It is the principal federal agency responsible for administering grants and funding under the Infrastructure Investment and Jobs Act.
Network Node	A connection point in a communications network. Each node is an endpoint for data transmissions or redistribution. Nodes have either a programmed or engineered capability to recognize, process and forward transmissions to other network nodes.
Nielsen's Law Of Internet Bandwidth	A high-end user's connection speed grows by 50% per year.

Notice Of Funding Opportunities (NOFO)	Notice of Funding Opportunities (NOFO) describe the requirements under which a federal agency will award grants for funding as instructed by a specific law. In this case, it's the Infrastructure, Investment, and Jobs Act, Public Law 117-58, November 15th. 2021. The Infrastructure, Investment, and Jobs Act, provides new federal funding for the Assistant Secretary to make grants on a competitive basis for the deployment of broadband infrastructure. It also provides funding for Middle Mile projects, tribal broadband funding and digital inclusion and digital equity activities
O	
Open Access Network	Networks that offer wholesale access to network infrastructure or services provided on fair and reasonable terms with some degree of transparency and nondiscrimination.
Operating Margin (EBITDA Margin)	A measure of a company's operating profit as a percentage of its revenue. Knowing the EBITDA margin allows for a comparison of one company's real performance to others in its industry. EBITDA margin is calculated by dividing EBITDA by revenue.
Optical Line Terminal (OLT)	The device that serves as your ISPs endpoint of the passive optical network (PON). The OLT also provides the interface between a PON and your ISP's core network. Simply put, an OLT is ISP equipment. The OLT is the device that exists at your ISPs central hub. An OLT has a few purposes: -Control the information flowing upstream and downstream. -Convert the standard signals used by fiber optic service to the frequency and framing used by a PON system. -Coordinate the multiple analog or digital signals that are combined into one signal (called multiplexing) that happens between the ONT conversion devices. The upstream channel transmits different types of data and voice traffic from users to the ISP. The downstream channel is what receives data, voice and video traffic and sends it to all ONT devices on your network.
Optical Network Terminal (ONT)	The device that serves as the telecommunication chain's endpoint of the PON on your end. Another abbreviation to know is an ONU, which stands for Optical Network Unit. ONU and ONT are often used interchangeably. More or less, they are the same. Simply put, an ONT/ONU refer to the user side equipment. The ONT/ONU is the device that exists at your home or office. The ONT acts as an optical modem and communicates with your ISP through a fiber optical cable. The ONT sends user data upstream to the OLT and receives data on the downstream channel. ONT and OLT are essential devices in a PON network system.
Outside Plant (OSP)	In civilian telecommunications, outside plant refers to all of the physical cabling and supporting infrastructure (such as conduit, cabinets, tower or poles), and any associated hardware (such as repeaters) located between a demarcation point in a switching facility and a demarcation point in another switching center or customer premises.
P	

Packet Loss	Occurs when a packet of data being sent over the internet is not received or is incomplete. This is described in percentage of packets lost compared to packets sent. Packet loss in most cases is a result of poor signal/line quality.
Peering And Transit Agreements	Agreements that govern moving one entity's data traffic over another entity's network. With peering agreements, network owners allow each other's traffic to move over their networks at no cost or in some kind of cost-sharing arrangement. With transit agreements, the entity that wants to move the data (it may be an ISP or a content provider like Netflix) must pay the network owner to use their network. If a provider moves its own customers' data on its own network (e.g., sending an email to someone served by the same provider), there are no fees. If two entities don't have an agreement, the data may have to travel farther around on networks they do have agreements with, which can also slow traffic down.
Point of Presence (POP)	The particular place or facility where local Internet service providers connect to other networks. Distance from the Point of Presence can affect service availability and pricing.
Point To Point	A Point to Point Connection is a private data connection securely connecting two or more locations for private data services. A point to point connection is a closed network data transport service which does not traverse the public Internet and is inherently secure with no data encryption needed. Point to Point connections are available in a range of bandwidth speeds including point to point T1, point to point Ethernet or point to point DS3. A point to point connection provides unparalleled quality of service (QoS) as it is not a shared service (a private line) and follows the same direct network path every time. Point to Point links are used by businesses to provide reliable, secure point to point network data service for applications including credit card processing, file sharing, data backup, point to point VOIP, and video conferencing. A point to point network can also be configured to carry voice, video, Internet, and data services together over the same point to point connection. Point to Point circuits are also known as a Point to Point Link, Private Line, Leased Line, or Data Line.
Preferred Equity	A type of shareholder class. When a company files for bankruptcy, equity and debt holders are paid in a specific order that is dependent on the type of financing they are holding (also called the capital stack): 1. Bondholders (debt) 2. Preferred equity 3. Common stock
Project Finance	Project finance is the funding (financing) of long-term infrastructure using a non-recourse or limited recourse financial structure. The debt and equity used to finance the project are paid back from the cash flow generated by the project.
Public-Private Partnership (PPP)	Arrangements in which a governmental unit engages a private party to deliver an integrated solution for the design, construction, financing, operation and/or management of new or existing government-owned infrastructure projects.
Public Utility Company	An organization that maintains the infrastructure for a public service (often also providing a service using that infrastructure). Public utilities are subject to forms of public control and regulation ranging from local community-based groups to statewide government monopolies. Public utilities are meant to supply goods/services that are considered essential;

	water, gas, electricity, telephone, and other communication systems represent much of the public utility market.
R	
Revenue Bond	A category of municipal bond supported by the revenue from a specific project, such as a toll bridge, highway, or local stadium. Revenue bonds that finance income-producing projects are thus secured by a specified revenue source. Typically, revenue bonds can be issued by any government agency or fund that is managed in the manner of a business, such as entities having both operating revenues and expenses.
Revolving Credit Line	A type of financing that allows a borrower to maintain an open credit line up to a specified limit and make minimum monthly payments based on the balance and interest rate per the credit agreement. A revolving credit line typically comes with a variable interest rate set by a bank, meaning it can fluctuate with market conditions.
Rights-of-Way (ROW)	ROW are legal rights to pass through property owned by another. ROW are frequently used to secure access to land for digging trenches, deploying fiber, constructing towers and deploying equipment on existing towers and utility poles.
Rural Digital Opportunity Fund (RDOF)	The RDOF is the latest iteration of the FCC's universal service fund (USF), more recently referred to as the Connect America Fund (CAF). This program was developed decades ago to fund the construction and operation of telecommunications networks, and later, broadband networks. The goal of the program was to ensure comparable telecommunications services at affordable costs to rural Americans, to be on par with their urban counterparts. The initial focus of the USF was telephone service, but it has shifted focus in recent years to broadband service through the CAF. The RDOF is an extension of the CAF and will provide $20.4 billion in funding over a ten-year period to support broadband networks in rural communities across the country. The funding roots of RDOF come from traditional high-cost universal service funding previously earmarked for territories served by large "price cap" telecom carriers such as CenturyLink, Frontier, AT&T, and Verizon. Historically, the FCC provided this funding directly to these legacy telecom carriers to support broadband service in the rural communities served by them. But RDOF changed this process significantly.
Rural Electrical Cooperatives (RECs)	Electric cooperatives play a vital role in transforming communities. They are energy providers that act as engines of economic development in rural areas, responsible for 42% of U.S. electric distribution lines. These local energy and technology providers are shaped by the specific needs of the communities they serve, powering over 20 million businesses, homes, farms, and schools in 48 states. RECs are eligible to apply for and win IIJA broadband funding.

Rural Utility Service	A division of the U.S. Department of Agriculture, Rural Utility Service grew out of the Depression-era Rural Electrification Administration. Its mission is to help provide public utilities—water and sewer, electrification, and telecommunications—to rural areas through public-private partnerships providing loans and grants. RUS is one of three agencies that make up USDA Rural Development (including Rural Business-Cooperative Service and Rural Housing Service).
S	
Satellite Internet	Internet service provided via satellite. Satellite can be the only option for remote residents, but it is generally considered slow, less reliable, and more expensive than other options if and when they are available.
Secured Debt	Debt that is backed by property, like a car or a house. Should you default on the repayment of the loan or debt, the creditor can take the collateral instead of opening a debt collection on your record or suing you for payments.
Security	A certificate or other financial instrument that has monetary value and can be traded. Securities are generally classified as either equity securities, such as stocks and debt securities, such as bonds and debentures.
Senior Debt	Borrowed money that a company must repay first if it goes out of business.
Simple Agreement For Future Equity (SAFE)	An agreement between an investor and a company that provides rights to the investor for future equity in the company similar to a warrant, except without determining a specific price per share at the time of the initial investment.
Spectrum	A conceptual tool used to organize and map the physical phenomena of electromagnetic waves. These waves propagate through space at different radio frequencies, and the set of all possible frequencies is called the electromagnetic spectrum.
Subgrantee	The government or other legal entity to which a subgrant is awarded and which is accountable to the grantee for the use of the funds provided. Under the Infrastructure, Investment and Jobs Act, the grantee must be an eligible entity.
Subordinated Debenture	An unsecured loan or bond that ranks below other, more senior loans or securities with respect to claims on assets or earnings. In the case of borrower default, creditors who own subordinated debt will not be paid out until after senior bondholders are paid in full.
Subsidiarity	Subsidiarity is a principle of social organization that holds that social and political issues should be dealt with at the most immediate (or local) level that is consistent with their resolution.
Symmetric	When the upload and download speeds match. A rate of 10 Mbps down/10 Mbps up would be symmetric.
T	
Take Rate	The percentage of potential subscribers who are offered the service that actually do subscribe. Within the context of information infrastructure investment, take rate has become a byword for network viability and success, making it a key economic driver of the investment.
Tax-Exempt Debt	An investment in which the income produced is free from federal, state, and/or local taxes. Most tax-exempt securities come in the form of municipal bonds, which represent obligations of a state, territory or

	County. For some investors, U.S. Savings Bond interest may also be free from federal income taxes.
Taxable Debt	A debt security whose return to the investor is subject to taxes at the local, state, or federal level, or some combination thereof. An investor trying to decide whether to invest in a taxable bond or tax-exempt bond should consider what they will have left in income after taxes are taken.
Telecommunications Act Of 1996	The Telecommunications Act of 1996 was the first significant overhaul of United States telecommunications law in more than sixty years, amending the Communications Act of 1934. The Act, signed by President Bill Clinton, represented a major change in American telecommunication law, since it was the first time that the Internet was included in broadcasting and spectrum allotment. According to the Federal Communications Commission (FCC), the goal of the law was to "let anyone enter any communications business – to let any communications business compete in any market against any other." The legislation's primary goal was deregulation of the converging broadcasting and telecommunications markets.
Telemedicine	The use of high-speed, high-capacity Internet to support long-distance healthcare services, patient and provider education and enhanced healthcare administration.
Tier 1, 2, 3	Classification indicating the size of a service provider. Tier 1 providers are the largest, such as AT&T, CenturyLink, Zayo, and Verizon, with network systems that span the globe. They can generally send data anywhere without having to pay transit fees, either because they own the network, or they have peering agreements with other networks. A Tier 2 network “peers” with many networks, but also has to pay some transit fees. A Tier 3 service provider must pay transit fees to access the Internet.
Tribal Broadband Connectivity Program	The Tribal Broadband Connectivity Program is a $980 million program directed to tribal governments to be used for broadband deployment on tribal lands, as well as for telehealth, distance learning, broadband affordability, and digital inclusion. NTIA is continuing to review the more than 280 applications received during the application window, which closed on Sept. 1, 2021. The Tribal Broadband Connectivity Program will announce additional awards on a rolling basis as they go through NTIA's review process.
U	
Underserved	A location that, as determined in accordance with the broadband DATA maps, is (1) Not an Unserved location, and (2) Lacks access to reliable broadband service with a speed of not less than 100 megabits per second for downloads, 20 megabits per second for uploads, and a latency sufficient to support real-time, interactive applications.
Underserved Service Project	According to the BEAD Program, a project in which not less than 80% of broadband-serviceable locations served by the project are Unserved locations or Underserved locations.

Universal Service Fund	A central principle of the Communications Act of 1934 was that all Americans should have access to a basic level of telecommunications service—universal service—and many policies were enacted to carry out that goal. The Telecommunications Act of 1996 created the Universal Service Fund, a pool of money collected from telecommunications companies and used for building and maintaining telecommunications infrastructure and services in high-cost areas. Four programs are supported by the Fund: the High-Cost Program, Lifeline Program, Rural Health Care Program, and Schools and Libraries Program. Telecommunications companies may charge a Universal Service Fund fee back to customers to help recover some of their contribution to the program.
Unlevered Returns	The implied rate of return a company expects to earn without the effect of debt.
Unlimited-Tax General Obligation Pledge	Is similar to the limited-tax pledge. The only difference is that the local government is asked to increase property tax rates to necessary levels — up to a maximum of 100% — to cover delinquencies from taxpayers. Residents must first agree to increase property taxes to the necessary amounts required for the bonds.
Unsecured Debt	Debt that is not backed by an asset pledged as collateral.
Unserved	A broadband-serviceable location, as determined in accordance with the broadband DATA maps, that has no access to broadband service or lacks access to reliable broadband service with a speed of not less than 25 megabits per second for downloads, 3 megabits per second for uploads, and a latency sufficient to support real-time, interactive applications.
Unserved Service Project	According to the BEAD Program, a project in which not less than 80% of broadband-serviceable locations served by the project are Unserved locations.
Upload And Download	The direction of the data between the end user and the service provider. Something moving “upstream” or “uploading” is moving from the end user’s computer or device to the service provider, while data moving “downstream” or “downloading” is moving from the service provider to the end user. When referring to speed, “10 down” means data is moving downstream to the end user at a rate of 10 megabits per second or Mbps, while “1 up” means data is moving at a rate of 1 Mbps up from the end user. Downstream is important in applications like streaming video, while upstream is important for end users who need to send large files somewhere, for instance, to a customer or to a hospital.
W	
Wi-Fi	A technology that produces a wireless local area network allowing a computer or other device to connect to the Internet wirelessly. Equipment in the device communicates with the Wi-Fi router, which is connected to the network with some type of physical cable or wire. Depending on the system’s power, the area can be as small as a room or cover several square miles. Examples include the Wi-Fi router in a home, a hotspot at a coffee shop, or citywide Wi-Fi networks. Wi-Fi is a trademark of the Wi-Fi Alliance, an organization that certifies equipment for interoperability. A generic term is “wireless local area network.”

Wireless	A short name for fixed-wireless (as opposed to mobile wireless). Fixed-wireless technology transmits data between two fixed antennas using radio waves, including microwaves. Unlike Wi-Fi, the radio beams are often kept narrow to keep up the strength of the signal. Antennas are preferably set up high on buildings since line of sight is necessary.
WISP	An ISP that provides service through a wireless network.
Working Capital/ Net Working Capital	The difference between a company's current assets—such as cash, accounts receivable/customers' unpaid bills, and inventories of raw materials and finished goods—and its current liabilities, such as accounts payable and debts. A measure of a company's liquidity and short-term financial health.
Y	
Yield On Cost (YOC)	The percentage an unlevered broadband project pays out per year in EBITDA based on the initial cost of the project. This metric is useful to compare the potential return to investors across multiple geographic regions when all project assumptions are held constant.

10 APPENDIX 3 – BREAKDOWN OF REVENUE FROM OWNED LAST MILE

	Fund xxx Beginning Cash:	-	(21,539,555)	(42,580,293)	(63,088,750)	(82,917,503)	(102,482,741)	(122,074,988)	(141,495,731)	(160,917,321)	(180,341,308)	(199,595,410)	(218,854,406)	(238,120,006)	(257,217,828)	(276,325,094)	(295,443,693)	(314,397,164)	(333,365,189)	(352,349,857)	(371,172,648)
		Estimate 1	Estimate 2	Estimate 3	Estimate 4	Estimate 5	Estimate 6	Estimate 7	Estimate 8	Estimate 9	Estimate 10	Estimate 11	Estimate 12	Estimate 13	Estimate 14	Estimate 15	Estimate 16	Estimate 17	Estimate 18	Estimate 19	Estimate 20
		24/25	**25/26**	**26/27**	**27/28**	**28/29**	**29/30**	**30/31**	**31/32**	**32/33**	**33/34**	**34/35**	**35/36**	**36/37**	**37/38**	**38/39**	**39/40**	**40/41**	**41/42**	**42/43**	**43/44**
Revenue																					
		70			75			80			85			90			95			100	
900	Residential - User Fees	504,000	1,008,000	1,512,000	2,160,000	2,430,000	2,440,800	2,615,040	2,626,560	2,638,080	2,815,200	2,827,440	2,839,680	3,019,680	3,032,640	3,045,600	3,228,480	3,242,160	3,255,840	3,441,600	3,456,000
75	Residential - Installations	45,000	45,000	45,000	45,000	22,500	900	900	900	900	900	900	900	900	900	900	900	900	900	900	900
	Residential - Other	47,250	83,250	119,250	155,250	167,625	162,945	163,665	164,385	165,105	165,825	166,545	167,265	167,985	168,705	169,425	170,145	170,865	171,585	172,305	173,025
1,200	Small Business (SMB100) - User Fees	-	-	3,600	7,200	10,800	14,400	18,000	21,600	25,200	28,800	32,400	36,000	39,600	43,200	46,800	50,400	54,000	57,600	61,200	64,800
1,800	Small Business (SMB300) - User Fees	-	-	5,400	10,800	16,200	21,600	27,000	32,400	37,800	43,200	48,600	54,000	59,400	64,800	70,200	75,600	81,000	86,400	91,800	97,200
3,000	Small Business (SMB500) - User Fees	-	-	9,000	18,000	27,000	36,000	45,000	54,000	63,000	72,000	81,000	90,000	99,000	108,000	117,000	126,000	135,000	144,000	153,000	162,000
5,400	Small Business (SMB1000) - User Fees	-	-	5,400	10,800	16,200	21,600	27,000	32,400	37,800	43,200	48,600	54,000	59,400	64,800	70,200	75,600	81,000	86,400	91,800	97,200
100	Small Business - Installations	-	-	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
60	Small Business - Other Fees	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9,000	Enterprise - User Fees	-	-	9,000	18,000	27,000	36,000	45,000	54,000	63,000	72,000	81,000	90,000	99,000	108,000	117,000	126,000	135,000	144,000	153,000	162,000
500	Enterprise - Installations	-	-	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500
	Enterprise - Other Fees	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5%	Late Penalties	29,813	56,813	85,508	121,328	135,941	136,787	147,155	149,387	151,619	162,131	164,399	166,667	177,323	179,627	181,931	192,731	195,071	197,411	208,355	210,731
	Disconnect Fees	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
0.000%	Interest Income	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Transfer in									-	-										
	Total Revenue:	626,063	1,193,063	1,795,658	2,547,878	2,854,766	2,872,532	3,090,260	3,137,132	3,184,004	3,404,756	3,452,384	3,500,012	3,723,788	3,772,172	3,820,556	4,047,356	4,096,496	4,145,636	4,375,460	4,425,356
Expenditures																					
0%	Salaries & Wages	495,000	534,850	575,896	618,172	636,718	655,819	675,494	695,758	716,631	738,130	760,274	783,082	806,575	830,772	855,695	881,366	907,807	935,041	963,092	991,985
0%	Overtime Pay	26,000	26,000	26,000	26,000	26,000	26,000	26,000	26,000	26,000	26,000	26,000	26,000	26,000	26,000	26,000	26,000	26,000	26,000	26,000	26,000
0%	Employer - SS/Medicare	39,857	42,905	46,045	49,279	50,698	52,159	53,664	55,215	56,811	58,456	60,150	61,895	63,692	65,543	67,450	69,413	71,436	73,520	75,666	77,876
0%	Employer - Retirement	83,360	89,736	96,303	103,068	106,035	109,091	112,239	115,481	118,821	122,261	125,804	129,453	133,212	137,084	141,071	145,179	149,409	153,767	158,255	162,878
0%	Group Insurance Costs	144,000	144,000	144,000	144,000	144,000	144,000	144,000	144,000	144,000	144,000	144,000	144,000	144,000	144,000	144,000	144,000	144,000	144,000	144,000	144,000
0%	Worker's Comp Insurance	10,420	11,217	12,038	12,883	13,254	13,636	14,030	14,435	14,853	15,283	15,725	16,182	16,651	17,135	17,634	18,147	18,676	19,221	19,782	20,360
	Personnel Costs:	798,637	848,708	900,282	953,403	976,705	1,000,706	1,025,427	1,050,889	1,077,116	1,104,130	1,131,953	1,160,612	1,190,130	1,220,534	1,251,850	1,284,105	1,317,328	1,351,548	1,386,795	1,423,098
3%	City Attorney	50,000	51,500	53,045	54,636	56,275	57,964	59,703	61,494	63,339	65,239	67,196	69,212	71,288	73,427	75,629	77,898	80,235	82,642	85,122	87,675
3%	Auditing & Financial Services	12,500	12,875	13,261	13,659	14,069	14,491	14,926	15,373	15,835	16,310	16,799	17,303	17,822	18,357	18,907	19,475	20,059	20,661	21,280	21,919
3%	Software	125,000	128,750	132,613	136,591	140,689	144,909	149,257	153,734	158,346	163,097	167,990	173,029	178,220	183,567	189,074	194,746	200,588	206,606	212,804	219,188
3%	Licenses, Reg, & Inspection	1,000	1,030	1,061	1,093	1,126	1,159	1,194	1,230	1,267	1,305	1,344	1,384	1,426	1,469	1,513	1,558	1,605	1,653	1,702	1,754
3%	Other Services	85,000	87,550	90,177	92,882	95,668	98,538	101,494	104,539	107,675	110,906	114,233	117,660	121,190	124,825	128,570	132,427	136,400	140,492	144,707	149,048
3%	Other - Prof/Tech Services	25,000	25,750	26,523	27,318	28,138	28,982	29,851	30,747	31,669	32,619	33,598	34,606	35,644	36,713	37,815	38,949	40,118	41,321	42,561	43,838
3%	Education & Training	15,000	15,450	15,914	16,391	16,883	17,389	17,911	18,448	19,002	19,572	20,159	20,764	21,386	22,028	22,689	23,370	24,071	24,793	25,536	26,303
3%	Travel & Meals	5,000	5,150	5,305	5,464	5,628	5,796	5,970	6,149	6,334	6,524	6,720	6,921	7,129	7,343	7,563	7,790	8,024	8,264	8,512	8,768
3%	Contracted Services	25,000	25,750	26,523	27,318	28,138	28,982	29,851	30,747	31,669	32,619	33,598	34,606	35,644	36,713	37,815	38,949	40,118	41,321	42,561	43,838
3%	Advertising	30,000	30,900	31,827	32,782	33,765	34,778	35,822	36,896	38,003	39,143	40,317	41,527	42,773	44,056	45,378	46,739	48,141	49,585	51,073	52,605
3%	Dues/Fees/Subscriptions	7,500	7,725	7,957	8,195	8,441	8,695	8,955	9,224	9,501	9,786	10,079	10,382	10,693	11,014	11,344	11,685	12,035	12,396	12,768	13,151
3%	Uniform Rental/Cleaning	2,500	2,575	2,652	2,732	2,814	2,898	2,985	3,075	3,167	3,262	3,360	3,461	3,564	3,671	3,781	3,895	4,012	4,132	4,256	4,384
3%	Communications - Mobile	5,000	5,150	5,305	5,464	5,628	5,796	5,970	6,149	6,334	6,524	6,720	6,921	7,129	7,343	7,563	7,790	8,024	8,264	8,512	8,768
3%	Communications - Telephone	1,400	1,442	1,485	1,530	1,576	1,623	1,672	1,722	1,773	1,827	1,881	1,938	1,996	2,056	2,118	2,181	2,247	2,314	2,383	2,455
	Services:	389,900	401,597	413,645	426,054	438,836	452,001	465,561	479,528	493,914	508,731	523,993	539,713	555,904	572,581	589,759	607,451	625,675	644,445	663,779	683,692
3%	General Office Supplies	2,500	2,575	2,652	2,732	2,814	2,898	2,985	3,075	3,167	3,262	3,360	3,461	3,564	3,671	3,781	3,895	4,012	4,132	4,256	4,384
3%	Postage & Shipping	150	155	159	164	169	174	179	184	190	196	202	208	214	220	227	234	241	248	255	263
3%	Fuel	4,500	4,635	4,774	4,917	5,065	5,217	5,373	5,534	5,700	5,871	6,048	6,229	6,416	6,608	6,807	7,011	7,221	7,438	7,661	7,891
3%	Uniforms & Laundry	3,000	3,090	3,183	3,278	3,377	3,478	3,582	3,690	3,800	3,914	4,032	4,153	4,277	4,406	4,538	4,674	4,814	4,959	5,107	5,261
3%	Other Supplies - Employee Relations	11,500	11,845	12,200	12,566	12,943	13,332	13,732	14,144	14,568	15,005	15,455	15,919	16,396	16,888	17,395	17,917	18,454	19,008	19,578	20,165
3%	Computer Hardware	20,000	20,600	21,218	21,855	22,510	23,185	23,881	24,597	25,335	26,095	26,878	27,685	28,515	29,371	30,252	31,159	32,094	33,057	34,049	35,070
3%	Communication Equipment	2,000	2,060	2,122	2,185	2,251	2,319	2,388	2,460	2,534	2,610	2,688	2,768	2,852	2,937	3,025	3,116	3,209	3,306	3,405	3,507
3%	Office Furniture & Equipment	1,000	1,030	1,061	1,093	1,126	1,159	1,194	1,230	1,267	1,305	1,344	1,384	1,426	1,469	1,513	1,558	1,605	1,653	1,702	1,754
3%	Small Tools & Equipment	15,000	15,450	15,914	16,391	16,883	17,389	17,911	18,448	19,002	19,572	20,159	20,764	21,386	22,028	22,689	23,370	24,071	24,793	25,536	26,303
3%	Machinery, Tools, & Equipment	5,000	5,150	5,305	5,464	5,628	5,796	5,970	6,149	6,334	6,524	6,720	6,921	7,129	7,343	7,563	7,790	8,024	8,264	8,512	8,768
3%	Safety Equipment & Devices	5,000	5,150	5,305	5,464	5,628	5,796	5,970	6,149	6,334	6,524	6,720	6,921	7,129	7,343	7,563	7,790	8,024	8,264	8,512	8,768
	Supplies:	69,650	71,740	73,892	76,108	78,392	80,743	83,166	85,661	88,231	90,877	93,604	96,412	99,304	102,283	105,352	108,512	111,768	115,121	118,574	122,132
5%	R&M - Buildings & Structures	20,000	21,000	22,050	23,153	24,310	25,526	26,802	28,142	29,549	31,027	32,578	34,207	35,917	37,713	39,599	41,579	43,657	45,840	48,132	50,539
5%	R&M - Infrastructure	50,000	52,500	55,125	57,881	60,775	63,814	67,005	70,355	73,873	77,566	81,445	85,517	89,793	94,282	98,997	103,946	109,144	114,601	120,331	126,348
5%	R&M - Equipment (HVAC)	5,000	5,250	5,513	5,788	6,078	6,381	6,700	7,036	7,387	7,757	8,144	8,552	8,979	9,428	9,900	10,395	10,914	11,460	12,033	12,635
5%	R&M - Truck & Auto	5,000	5,250	5,513	5,788	6,078	6,381	6,700	7,036	7,387	7,757	8,144	8,552	8,979	9,428	9,900	10,395	10,914	11,460	12,033	12,635
5%	R&M - Computer Hardware & Software	6,500	6,825	7,166	7,525	7,901	8,296	8,711	9,146	9,603	10,084	10,588	11,117	11,673	12,257	12,870	13,513	14,189	14,898	15,643	16,425
	R&M:	86,500	90,825	95,366	100,135	105,141	110,398	115,918	121,714	127,800	134,190	140,899	147,944	155,342	163,109	171,264	179,827	188,819	198,260	208,173	218,581
	Debt Services - Principal & Interest	20,819,931	20,819,931	20,819,931	20,819,931	20,819,931	20,819,931	20,819,931	20,819,931	20,819,931	20,819,931	20,819,931	20,819,931	20,819,931	20,819,931	20,819,931	20,819,931	20,819,931	20,819,931	20,819,931	20,819,931
	Paying Agent Fees	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
	Capital Expenditures	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Sundry:	20,820,931	20,820,931	20,820,931	20,820,931	20,820,931	20,820,931	20,820,931	20,820,931	20,820,931	20,820,931	20,820,931	20,820,931	20,820,931	20,820,931	20,820,931	20,820,931	20,820,931	20,820,931	20,820,931	20,820,931
	Total Expenditures:	22,165,617	22,233,800	22,304,115	22,376,631	22,420,004	22,464,779	22,511,003	22,558,723	22,607,991	22,658,859	22,711,380	22,765,612	22,821,611	22,879,438	22,939,155	23,000,827	23,064,521	23,130,305	23,198,251	23,268,434
	Net Income/(Loss):	(21,539,555)	(21,040,738)	(20,508,458)	(19,828,753)	(19,565,238)	(19,592,247)	(19,420,742)	(19,421,591)	(19,423,987)	(19,254,102)	(19,258,996)	(19,265,599)	(19,097,823)	(19,107,266)	(19,118,599)	(18,953,471)	(18,968,024)	(18,984,668)	(18,822,791)	(18,843,078)
	Ending Cash:	(21,539,555)	(42,580,293)	(63,088,750)	(82,917,503)	(102,482,741)	(122,074,988)	(141,495,731)	(160,917,321)	(180,341,308)	(199,595,410)	(218,854,406)	(238,120,006)	(257,217,828)	(276,325,094)	(295,443,693)	(314,397,164)	(333,365,189)	(352,349,857)	(371,172,648)	(390,015,726)