Lit Communities

Defiance County **Broadband Plan**

November 16, 2022

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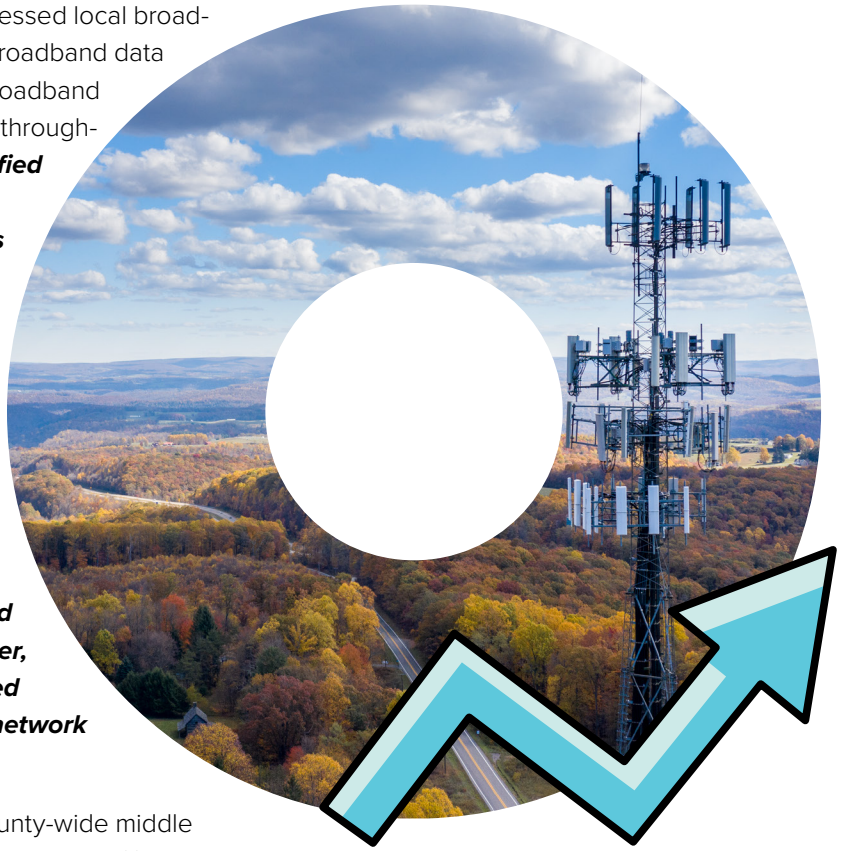
Executive Summary

The Defiance County Commissioners released a Request for Proposals (RFP) in May 2021 for a Broadband Internet Study (the Study). Lit Communities submitted a proposal to conduct the Study and was awarded this work in February 2022. Lit conducted the corresponding community assessment from April 2022 to October 2022. The community assessment was designed to include the nine key tasks that were incorporated in the RFP scope of work. Lit also brought in PNe, a wireless engineering firm, upon request by the Defiance County Commissioners to conduct a low-level wireless engineering design. This wireless design along with the preliminary designs for a county-wide middle-mile and last-mile fiber network provided data on costs and what the impact on connectivity could be for residents and businesses within Defiance County.



Lit's Market Service and Incumbent Analysis assessed local broadband services utilizing public and subscription broadband data tools. The data collected indicated a need for broadband infrastructure improvements over digital literacy throughout the County. ***The areas of the County identified as having the highest population of unserved (broadband service speeds less than 25 Mbps download and 3 Mbps upload) and underserved (broadband service speeds less than 100 Mbps download and 20 Mbps upload) or/and low or no fiber network penetration were Nye, Farmer, Adams, Richland, Washington, Milford and Tiffin Townships.*** Among the providers within Defiance County with middle mile fiber infrastructure, there is limited last-mile fiber service currently made available. ***The areas showing the greatest need for infrastructure are Hicksville, Milford, Farmer, and Washington Townships. It is recommended that these areas be prioritized for any future network development.***

Lit developed one (1) preliminary design for a county-wide middle mile network utilizing existing street rights-of-way and one (1) last-mile design demonstrating how service would reach each premise within Defiance County. All designs include a bill of materials (BOM) that was incorporated into the corresponding financial model for each network. Based on

these models, ***we anticipate that a combination of both a fiber and wireless network will be necessary in Defiance County, especially for the underserved and unserved areas.***

Community forums and meetings with community leaders, stakeholders and local internet service providers revealed *frustration with current access and options, a strong desire to resolve watershed issues, a recognition of how a lack of connectivity affects Defiance County's agricultural community, and a commitment to continuing discussions regarding how the County and local providers can collaborate.* Additional community outreach through a community survey asked respondents about current access, speeds, pricing and opinion of the County's involvement in improving broadband connectivity. ***The majority of respondents (90%) expressed the importance or extreme importance of Defiance County addressing broadband.*** *Further, 53.3% of respondents are dissatisfied with current prices they are paying; 47% of respondents with internet connectivity had speed tests that do not meet the FCC definition of 25 Mbps download/ 3 Mbps upload, and the townships of Defiance, Tiffin, Farmer, Washington and the Village of Sherwood report the highest number of respondents without any connectivity.*

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Lastly, Lit's Grant Services team reviewed available federal and state funding opportunities for Defiance County. ***It is recommended that Defiance County consider the US Treasury Capital Projects Fund, the US Department of Agriculture ReConnect Program and the Department of Commerce (NTIA) Broadband Equity, Access and Deployment (BEAD) programs.*** Information regarding the application process, due dates and requirements are provided in this report. *The findings, data and recommendations developed during the Community Assessment will allow the County to determine which of these funding programs it would like to pursue.*

Lit Communities would like to thank the Defiance County Board of Commissioners for this opportunity to work with the County's residents, businesses, local providers and municipal and town leaders on the Broadband Internet Study. Commissioner David Kern, Commissioner Clerk Stephanie Metz and Erika Willitzer with Defiance County Economic Development provided leadership and guidance throughout the Study. Their time and expertise contributed to the success of this first phase of work to improve connectivity throughout Defiance County.

1 Introduction

Broadband Definition

Broadband is the transmission of large volume of data via voice, video, or text through a continuously active high-bandwidth and high-speed Internet connection [1.1] & [1.2]. The Federal Communications Commission (FCC) established the broadband standard for Internet access with download speeds equal to or greater than 25 Mbps (Megabits per second- broadband speed measurement unit) and upload speeds equal to or greater than 3 Mbps [1.1].

Served and Underserved Service Locations

The National Telecommunications and Information Administration (NTIA), a Government agency focused on creating programs and policies that increase the access to broadband Internet across the USA [1.3], catalogues service locations in the following two types based on broadband Internet speeds [1.4]:

Unserved Locations:

- Download speeds are less than 25 Mbps
- Upload speeds are less than 3 Mbps

Underserved Locations:

- Download speeds are equal to or greater than 25 Mbps and less than 100 Mbps
- Upload speeds are equal to or greater than 3 Mbps and less than 20 Mbps

Therefore, served locations have download speeds greater than 100 Mbps and upload speeds greater than 20 Mbps.

REFERENCES

[1.1] Fernando, K. (2021). Broadband Definition. Available at: https://www.investopedia.com/terms/b/broadband.asp

[1.2] Federal Communications Commission (2014). Types of Broadband Connections. Available at: https://www.fcc.gov/general/types-broadband-connections

[1.3] National Telecommunications and Information Administration – NTIA (2022). About NTIA. Available at: https://www.ntia.doc.gov/about

[1.4] National Telecommunications and Information Administration – NTIA (2022). Economics of Broadband Networks: An overview. Available at: https://broadbandusa.ntia.doc.gov/sites/default/files/2022-03/Economics%20of%20Broadband%20Networks%20PDF.pdf

Broadband Connection Types

Broadband transmission technologies are catalogued as follows [1.2]:

1. Fixed (wired) Broadband:

Data is transmitted through cables. Depending on the material, cables can be:

Fiber Optic Cables: It provides fast transmission speeds (download speed from 250 to 1,000 Mbps and upload speed from 250 to 1,000 Mbps [1.5] as data travels through an optic material (glass fibers) as pulses of light.

Cable Modem (coaxial cables): Data transmission is through TV cables at download speeds from 10 to 500 Mbps and upload speeds from 5 to 50 Mbps [1.5].

Copper Phone Lines (DSL - Digital Subscriber Line): Traditional copper telephone lines are utilized to transmit data at download speeds from 5 to 35 Mbps and upload speeds from 1 to 10 Mbps [1.5]. DSL is categorized in the following types:

- Asymmetrical Digital Subscriber Line (ADSL): Download transmission speed is higher than upload transmission speed. It does not interrupt telephone calls.
- Symmetrical Digital Subscriber Line (SDSL): Download and upload transmission speeds are similar.
- High data rate Digital Subscriber Line (HDSL) and Very High data rate Digital Subscriber Line (VDSL): They are faster DSL transmission types.

2. Wireless Broadband:

Data is transmitted through radio waves in the following two ways:

Mobile Wireless: The signal travels between the Internet Service Provider's antenna (located on a tower which is wired connected to the rest of the Internet network) and the customer's receiver/transmitter which can be:

- An antenna fixed placed and connected to a router via a wireline: This broadband transmission is called Fixed Wireless. Download and upload speeds depend on the type of customer [1.6]: Residential download and upload speeds are similar to DSL or Cable Modem, and business download and upload speeds are faster that residential offerings (approximately 500 Mbps of download and upload speed).
- A mobile device: The "fifth generation" mobile wireless or 5G is the latest standard. Download and upload speeds depend on frequency range and distance covered [1.7]. Hence, 5G is catalogued in three types [1.7]: I) Low-Band 5G: Speeds are up to 300 Mbps covering an area of 20 miles; II) Mid-Band 5G: Speeds are up to 1 Gbps and the coverage area is up to 10 miles; and III) High-Band 5G: Speeds are up to 4 Gbps covering an area less than 0.6 miles.

Satellite: The customer has an antenna wired connected to a satellite modem and router. The satellite operates as a data transmission link between the Internet Service Provider's antenna and the customer's antenna. Speed offerings range from 12 up to 100 Mbps in the near future [1.8] & [1.9].

In terms of transmission, wired services are more reliable than wireless options based on the medium used to transmit the data. Data transmitted via radio waves are more susceptible to interference due to physical and/or other wireless signal obstacles between the transmitter and receiver.

REFERENCES

[1.2] Federal Communications Commission (2014). Types of Broadband Connections. Available at: https://www.fcc.gov/general/types-broadband-connections

[1.5] BroadbandNow (2022). DSL vs. Cable vs. Fiber: Which Internet Option Is the Best Available at: https://broadbandnow.com/guides/dsl-vs-cable-vs-fiber

[1.6] BroadbandNow (2022). Terrestrial Fixed Wireless Internet In The United States. Available at: https://broadbandnow.com/Fixed-Wireless

[1.7] BroadbandNow (2022). 5G Internet in the USA. Available at: https://broadbandnow.com/5G

[1.8] BroadbandNow (2021). Satellite Internet in the USA. Available at: https://broadbandnow.com/Satellite

[1.9] BroadbandNow (2021). Best Satellite Internet Providers. Available at: https://broadbandnow.com/internet/best/satellite

Structure and Content of this Study

Chapter 2: Market Service & Incumbent Analysis

This is an analysis of current broadband Internet infrastructures and offerings in the County, using different public and private data sources. The analysis will assist the County in effectively allocating financial resources to areas in need of broadband.

Chapter 3: Preliminary Network Design (Fiber and Wireless)

A high-level design of both a middle and last mile fiber network and a wireless network for Defiance County. These preliminary designs define the paths and metrics associated with these networks and are used in estimating costs for network engineering and construction.

Chapter 4: Construction Ride Out (CRO) & Make Ready Engineering Analysis (MREA)

Categorization of the preliminary middle and last mile fiber network designs into aerial or underground with the purpose of obtaining a more accurate estimation of the network construction costs.

Chapter 5: Financial Model

Cost estimates for the preliminary designs of middle and last mile networks based on CRO and MREA results mentioned above. This provides the County with the investment required to design, build operate and maintain the middle and last mile networks.

Chapter 6: Community Survey

This task has the same objective as the Market Service & Incumbent Analysis, namely to determine the current health status of internet connectivity and services within Defiance using data collected from end users, Defiance County residents.

Chapter 7: Partner Engagement

Focus groups and interviews to better understand the perspectives of Defiance County residents, businesses,internet service providers and other stakeholders and to gauge community support for the County's efforts to address broadband challenges.

Chapter 8: Grant Services

Evaluation of federal and state broadband funding programs in order to financially support Defiance County middle and last mile networks as well as initiatives linked to economic development, emergency response, and tele-health.

Chapter 9: Next Steps

Prioritized recommendations and suggestions on actions the County can take to keep the project moving forward.

2 Market Service & Incumbent Analysis

Purpose

The Market Service & Incumbent Analysis evaluates the strength and ubiquity of the current broadband market in Defiance County. This analysis will enable Defiance County to target and prioritize areas that are most in need of broadband infrastructure, and allow for strategic decision making to minimize risk and amplify success in bridging digital divides in such markets.

Methodology

Lit Communities utilized publicly available broadband data sources and subscription-based tools to identify the existing internet service provider (ISP) landscape in Defiance County and then coalesced these sources to:

- Evaluate current ISP service offerings and pricing.
- Identify unserved and underserved areas within Defiance County by transmission type.
- Identify local fiber network ownership, including middle mile fiber networks and long haul fiber networks that may be leveraged for middle mile purposes, and their redundancy.
- Determine which of such areas are likely to experience broadband expansion through the FCC's Rural Digital Opportunity Fund (RDOF) program.
- Evaluate broadband adoption and digital inclusion across Defiance County.

Data Source and Purpose				
Source Name	**Source Type**	**Source Description**	**Data Collected & Analyzed**	**Purpose**
National Telecommunications and Information Administration (NTIA)	Public	Federal Agency focused on creating programs and policies that increase broadband access across the U.S. [2.1]	Broadband speed definitions for unserved and underserved locations [2.2]	Identifying unserved, underserved and served areas according to different sources, coalesced by the NTIA
Federal Communications Commission (FCC)	Public	Federal Agency responsible for implementing and enforcing America's communications law and regulations [2.3]	FCC Form 477	Determine broadband incumbents and technology penetration
			RDOF (Rural Digital Opportunity Fund) Auction 904	Identify RDOF-eligible areas in Defiance County
Purdue Center for Regional Development (PCRD)	Public	Purdue University research center that pursues the socio-economic progress of different regions across the U.S. through collaborative innovation [2.4]	Digital Divide Index (DDI)	The DDI measures primarily physical access/adoption and socioeconomic characteristics that may limit motivation, skills, and usage.
Purdue Center for Regional Development (PCRD)	Public	Purdue University research center that pursues the socio-economic progress of different regions across the U.S. through collaborative innovation [2.4]	Digital Distress	This metric evaluates broadband infrastructure, types of electronic devices owned and internet subscriptions that can augment or undermine the meaningful use of broadband for social and economic benefits.
BroadbandNow	Public	Online databases of internet service options available in a given area [2.5] & [2.6]	Advertised internet service offerings including providers, speed, price, and technologies	Determine broadband speed and corresponding price
FiberLocator	Subscription	Online telecommunications database of long-haul and middle-mile fiber infrastructure [2.7]	Existing fiber infrastructure in Defiance County	Define metro fiber networks (regional level/ middle mile) to evaluate network redundancy. Define long haul fiber networks (national level) to be leveraged by Defiance County to connect to middle mile

Results

1. Broadband Internet Service Providers (ISPs)

The FCC Form 477 Fixed Broadband Deployment Data (which is evaluated by census block) identifies the following ISPs in Defiance County:

ADSL2, ADSL2+
CenturyLink
Frontier Communications Corporation
Windstream Ohio Inc.

Asymmetric xDSL
Ayersville Telephone Company
CenturyLink
Farmers Mutual Telephone Company (OH)
Frontier Communications Corporation
Sherwood Mutual Telephone Association Inc
TDS TELECOM
Windstream Ohio Inc.

Cable Modem - DOCSIS 3.1
Charter Communications Inc
Mediacom Indiana LLC

Fiber
Arthur Mutual Telephone
Ayersville Telephone Company
CenturyLink
Farmers Mutual Telephone Company (OH)
QualStar Communications Inc.
Ridgeville Telephone Company
Rtec Communications Inc
Sherwood Mutual Telephone Association Inc

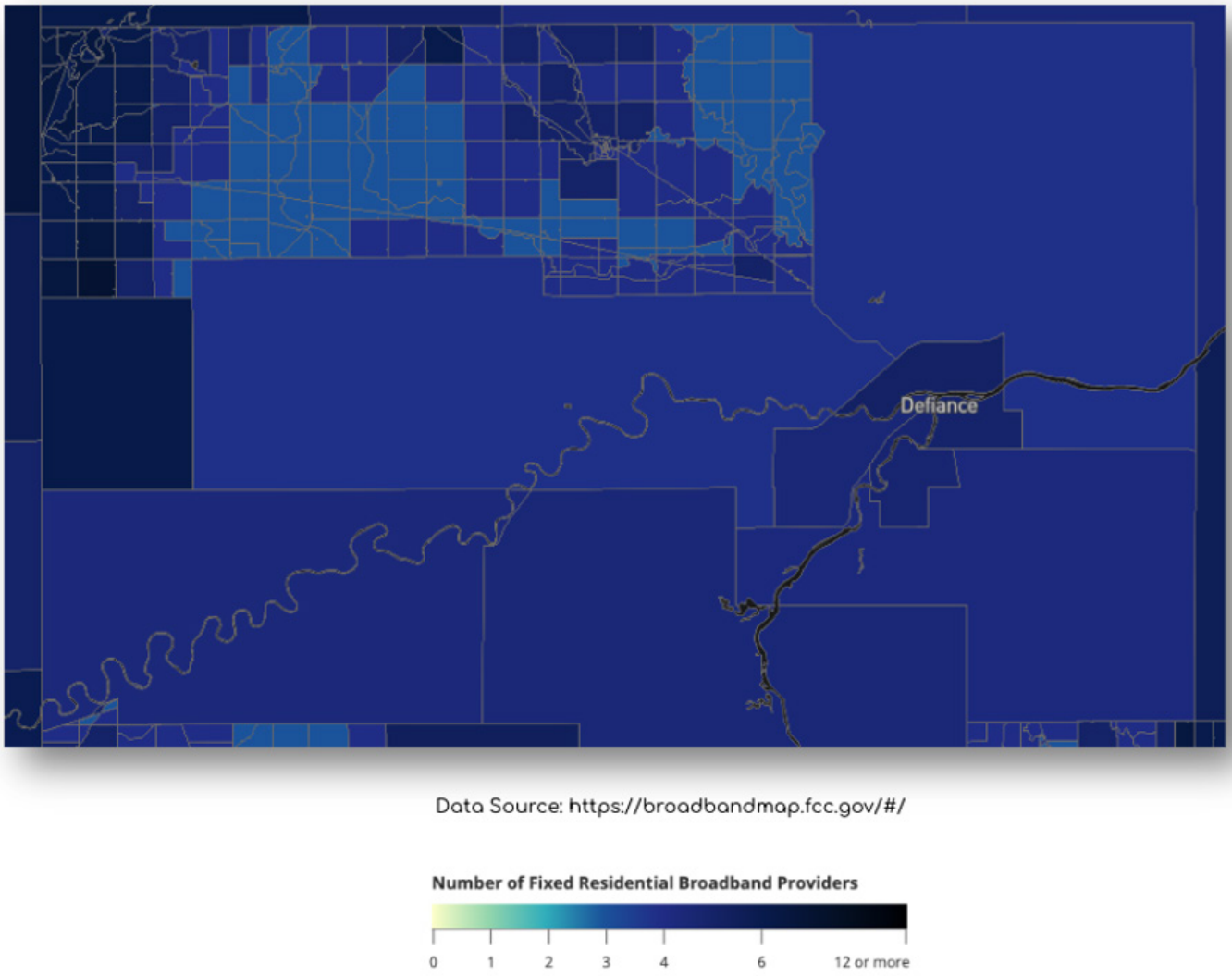
Satellite
HughesNet
Viasat Inc
VSAT Systems, LLC.

Terrestrial Fixed Wireless
Benton Ridge Telephone
Lakeland Internet
Mercury Wireless Indiana, LLC.
MetaLINK Technologies Inc.
NKTelco
SAA bright.net Inc.
T-Mobile
Watch Communications

VDSL
CenturyLink
Frontier Communications Corporation
Windstream Ohio Inc.

Defiance County, in general, has a moderate density of fixed residential broadband providers. However, FCC provider density does not speak to the service or pricing offered, simply whether 25 Mbps down/3 Mbps up service is available to a location within the census block[1]. Further, as identified below[2], Farmer Township, Tiffin Township, Lower Washingtown Township, and pockets of and Hicksville indicate few Fixed Broadband options.

Density of Internet Service Providers Providing Speeds of 25/3 Mbps (2021)



[1] So long as the reporting provider "does or could . . . without an extraordinary commitment of resources" serve at least one location within a census block, the provider can depict the entire census block as served by broadband at the reported speed, in this instance 25 Mbps download/ 3 Mbps upload. Fixed Broadband Deployment Data from FCC Form 477. (2020). Retrieved from Federal Communications Commission: https://www.fcc.gov/general/broadband-deployment-data-fcc-form-477.

[2] Map Source: https://broadbandmap.fcc.gov/#/

1a: Speed and Price:

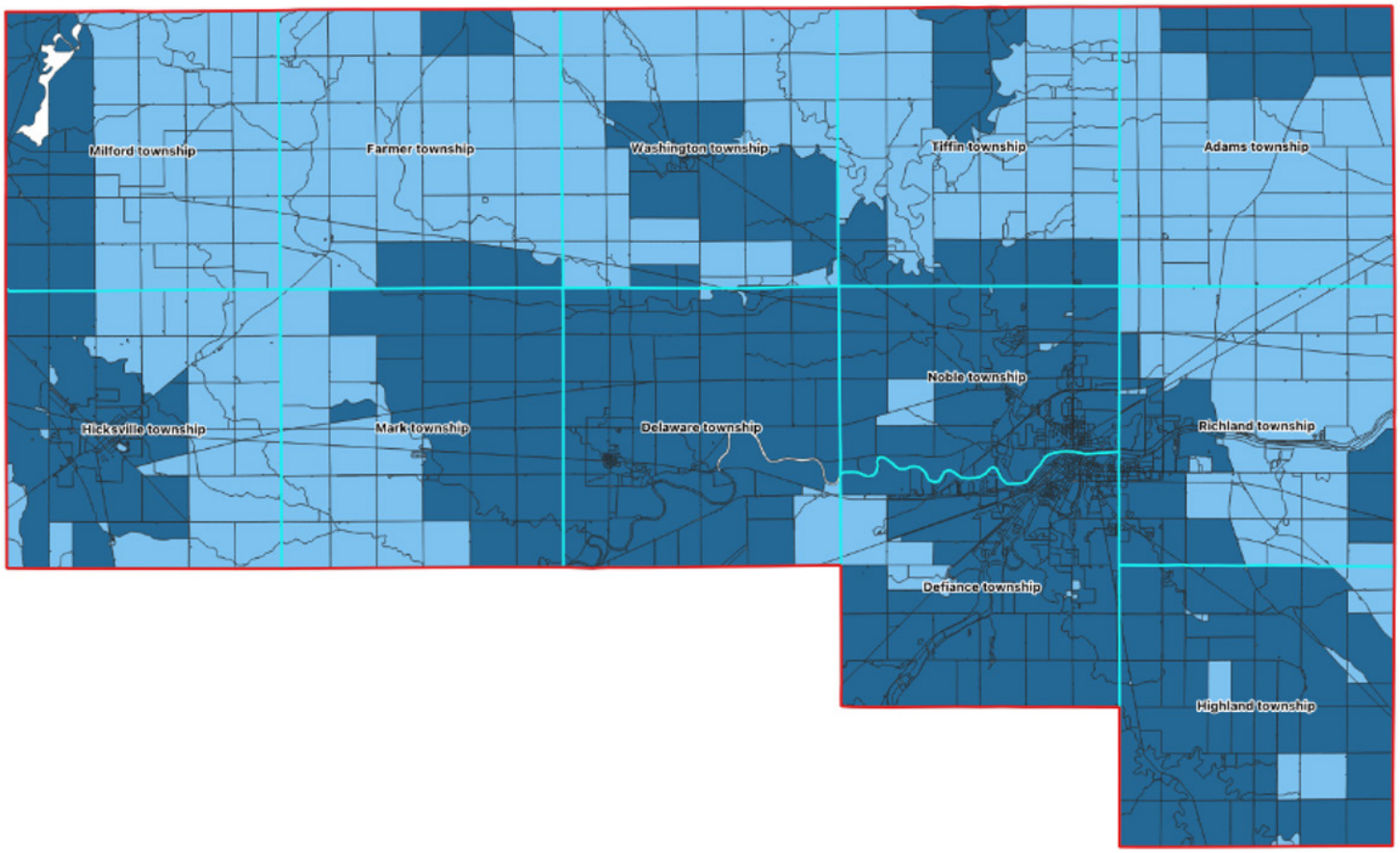
Given the limitations of the FCC data, we look to other sources to determine speed and price. As publicly advertised on BroadbandNow, the speeds and prices offered by providers and carriers claiming to serve Defiance County are as follows (Further detail can be found in Appendix A):

Advertised Speeds & Prices - Incumbent Providers & Carriers					
Customer Type	**Technology:**	**Min. Starting Price**	**Maximum Starting Price**	**Max. Download Speed (Up To, Mbps):**	**Max Upload Speed (Up To, Mbps):**
Residential	5G Internet	$50.00	Not Available	182	Not Available
	Cable	$31.00	$89.99	1000	1.5
	DSL	$24.95	$107.00	200	10
	Fiber	$39.99	$200.00	1000	920
	Fixed Wireless	$65.00	$120.00	150	20
	Satellite	$50	$159.99	50	Not Available
Business	Cable	$19.99	$90.00	1000	Not Available
	Copper	Not listed	Not listed	Not listed	Not Available
	DSL	$29.00	$65.00	100	0.256
	Fiber	$49.99	$149.95	1000	20
	Fixed Wireless	$99.99	$120	100	5

2. Unserved and Underserved Areas By Broadband Transmission Type:

The following broadband speed maps are based on FCC Form 477 Fixed Broadband Deployment data [2.8][3]. **According to the FCC, underserved areas are prevalent in Defiance County, particularly so in Farmer, Adams, Richland, Washington, Milford and Tiffin Townships**[4].

Unserved and Underserved areas based on Maximum ISP Speed per Census Block

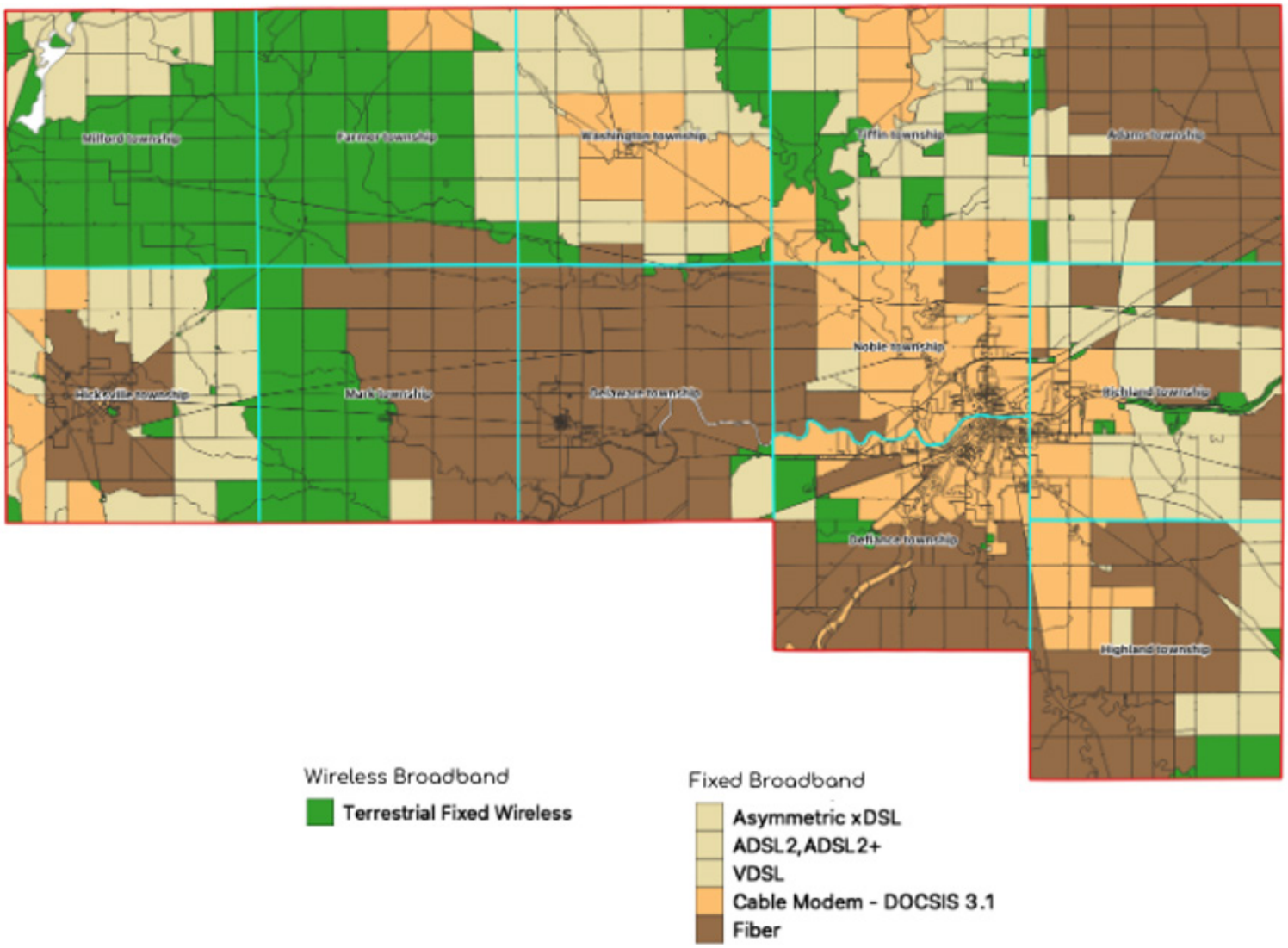


[3] FCC Form 477 data is cataloged as "Residential and Business", "Residential", and "Business", depending on the type of customer. There is no speed data available for the "Business"-only category.

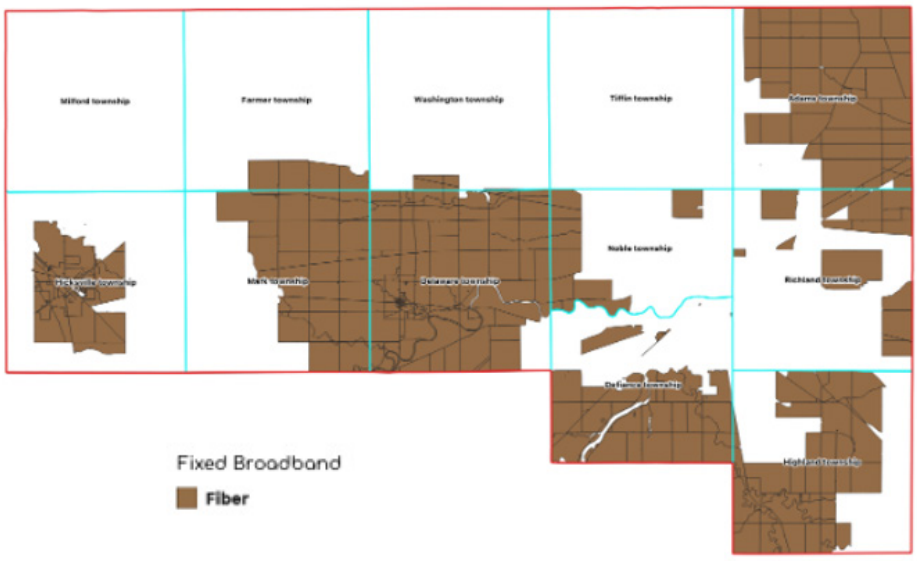
[4] Federal broadband coverage depictions can be inflated as a result of Form 477 filing requirements: in their submissions, so long as the reporting provider "does or could . . . without an extraordinary commitment of resources" serve at least one location within a census block, the provider can depict the entire census block as served by broadband at the reported speed.

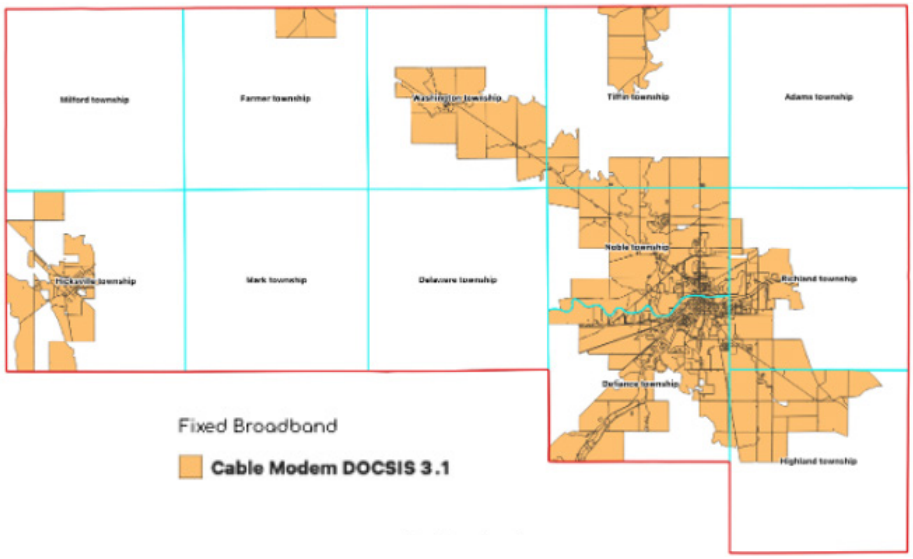
As the following maps indicate (and FCC penetration data supports), Milford, Farmer, Washington, Ney, and Tiffin Townships all have low or no fiber penetration. In these areas, the predominant technologies offering the highest available speeds are fixed wireless and DSL, excluding the areas in these Townships where cable is available.

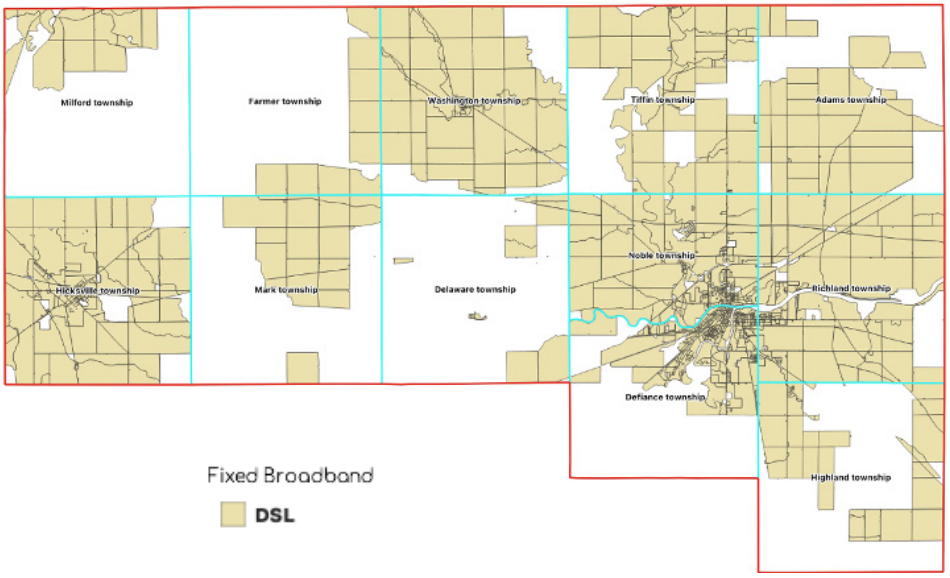
Technology Penetration based on Maximum ISP speed per Census Block



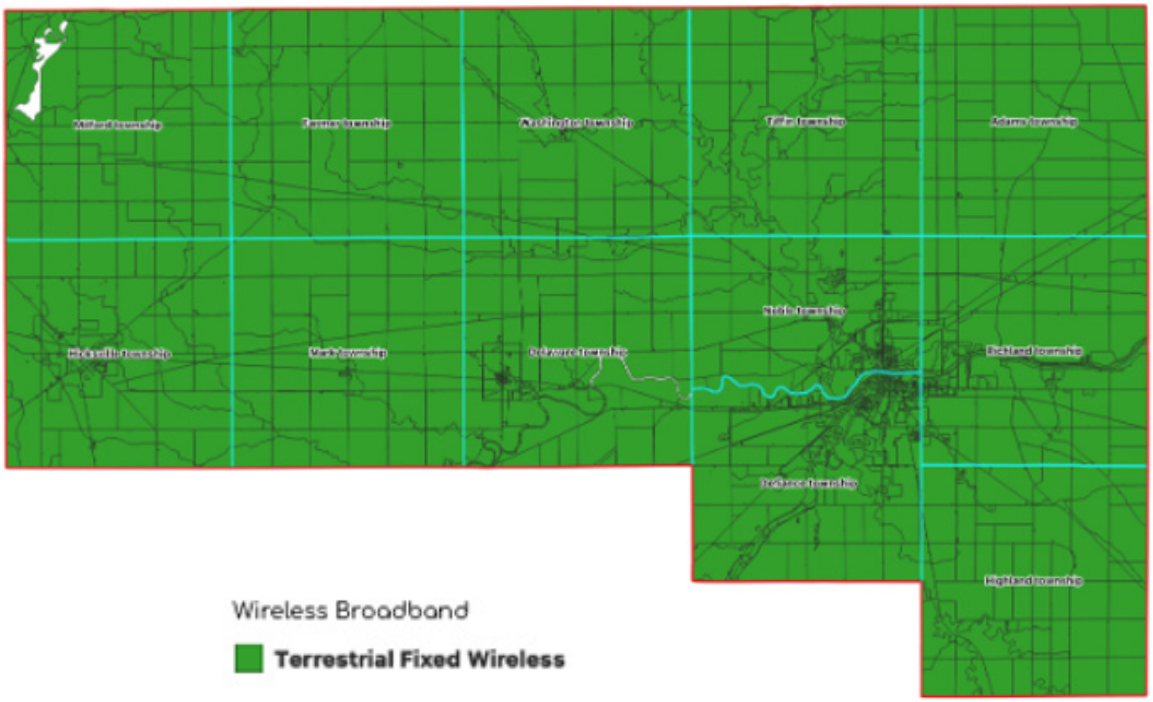
The following maps show each broadband transmission technology isolated individually[5]:

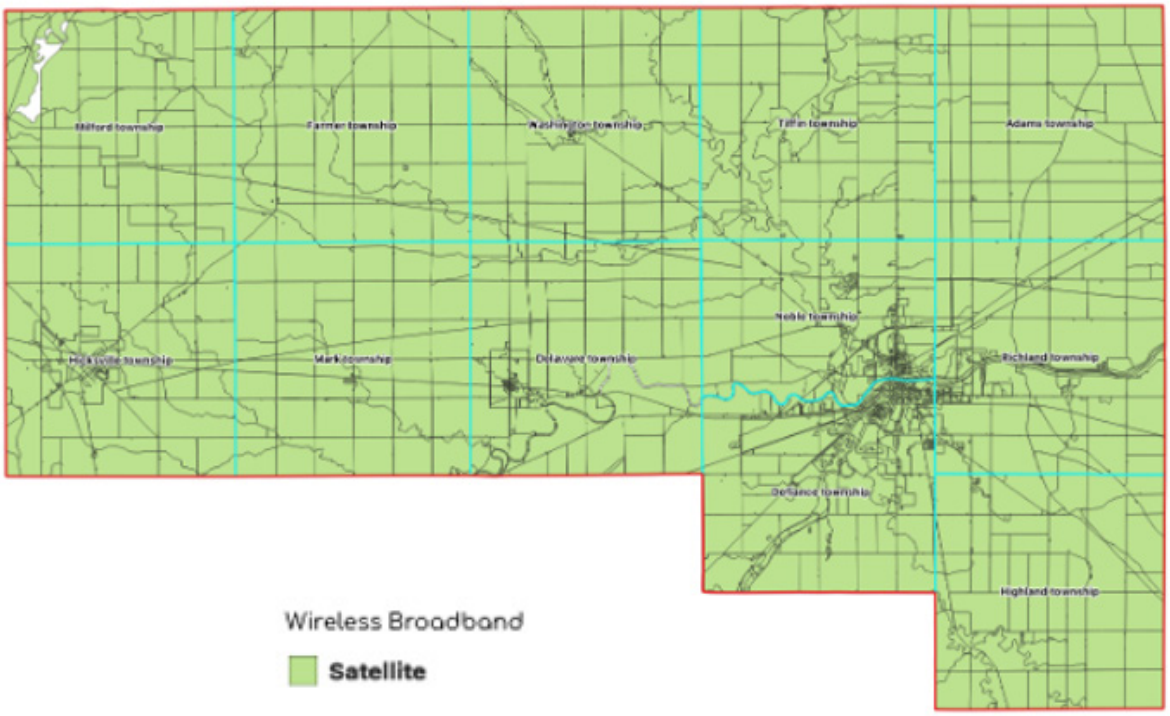






[5] FCC Form 477 data is cataloged as "Residential and Business", "Residential", and "Business", depending on the type of customer. There is no speed data available for the "Business"-only category.

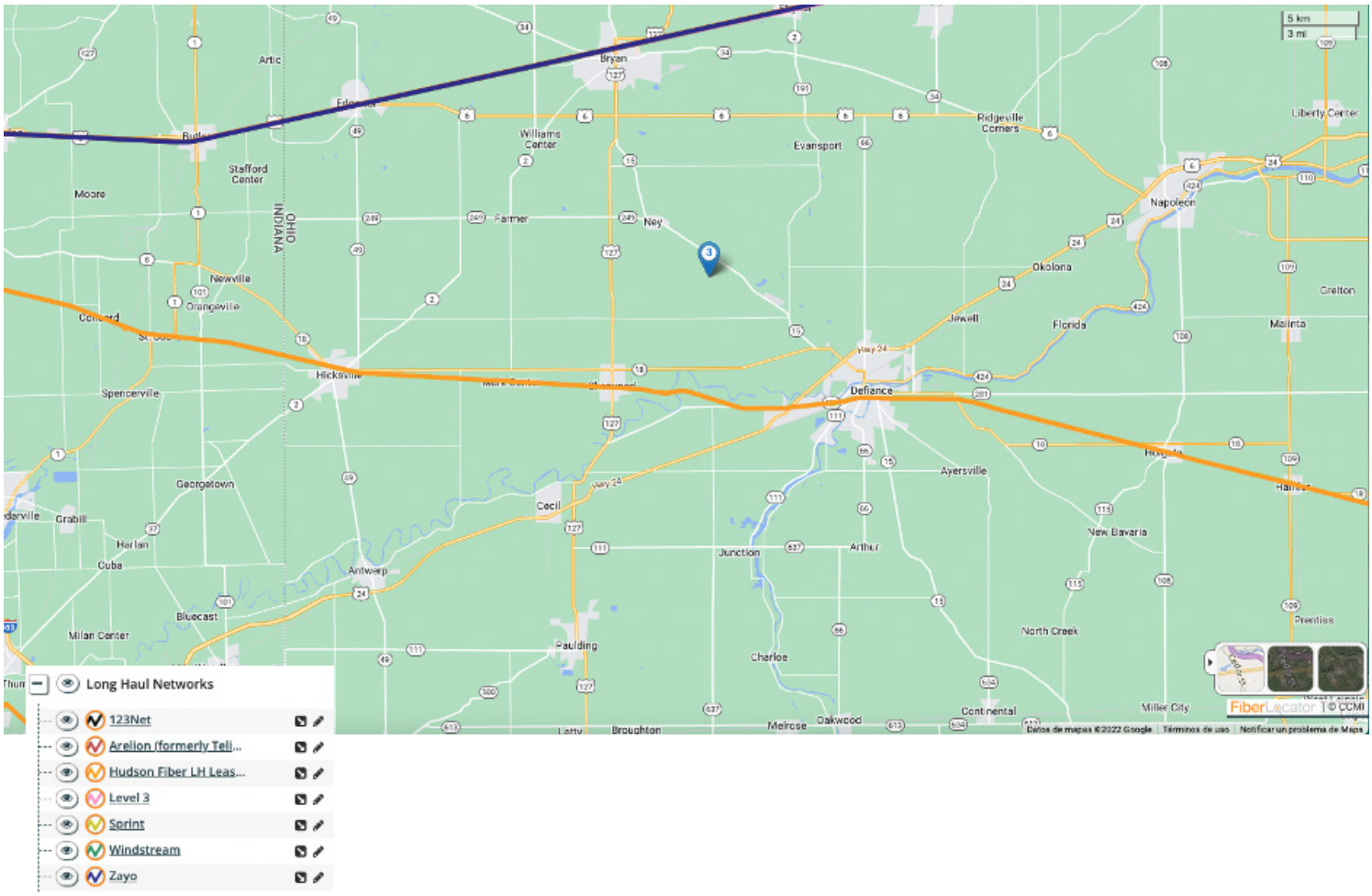

Wireless Broadband
Terrestrial Fixed Wireless


Wireless Broadband
Satellite

3. Existing Fiber Infrastructure in and surrounding Defiance County

There is long haul fiber[6] running east to west in Defiance County, as seen below:

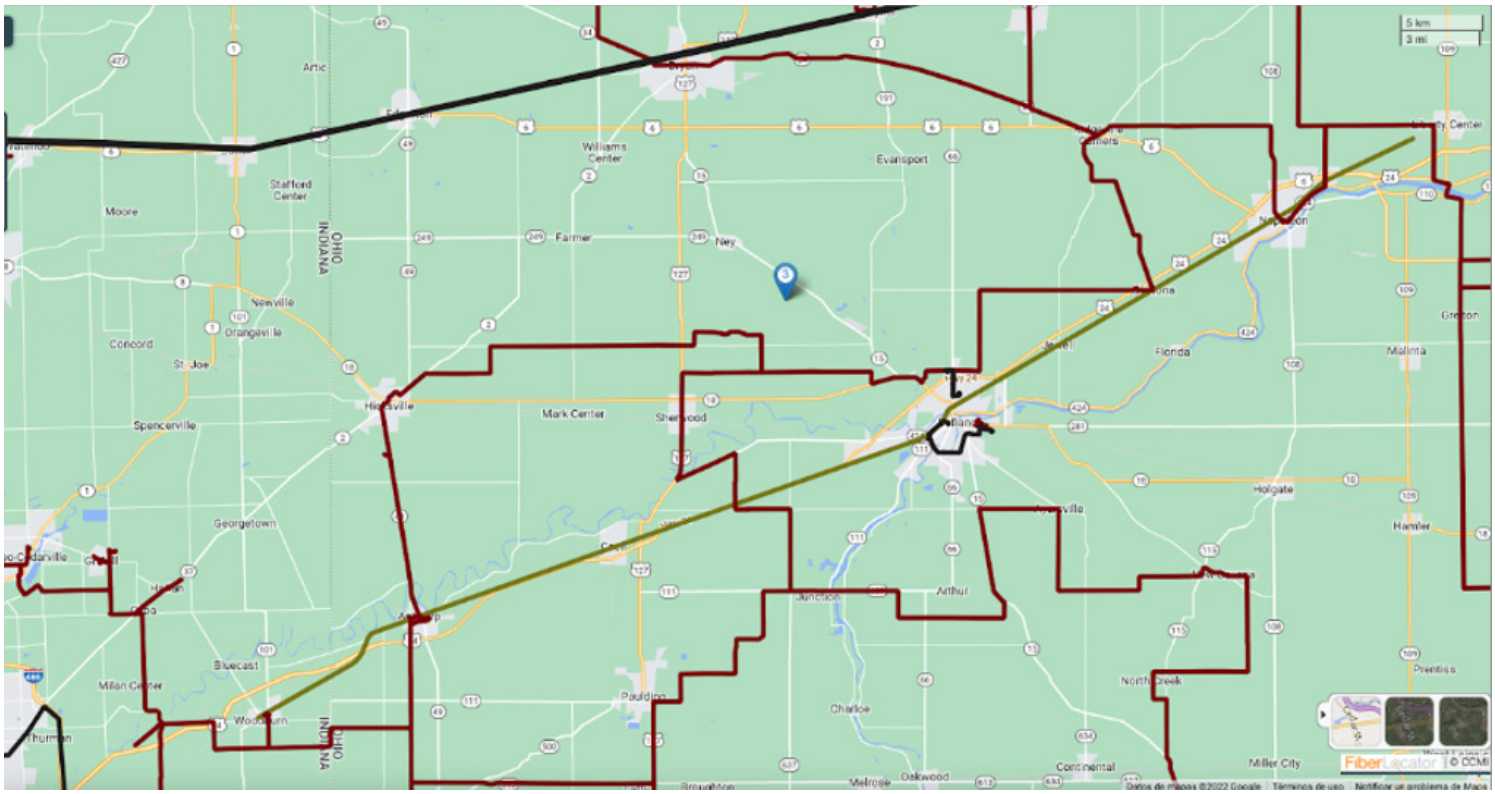
Long Haul Fiber Networks



[6] **Long-haul** refers to the network connection over long distances, such as nationwide, between various towns, cities, and other political subdivisions. **Middle-mile** refers to the network connection between the last-mile and the internet. For example, in a rural area, the middle mile would connect the town's network to a larger metropolitan area where it interconnects with major broadband carriers' long-haul networks. **Last-mile** is the final leg of an internet connection between a service provider and the customer. For example, the last-mile is the connectivity (from a service provider) that passes a home or business that allows them to use the internet once connected through what is called a "lateral" connection.

The reported middle mile infrastructure in Defiance County reflects limited access in certain pockets of Defiance County[7], as depicted below. It can further be inferred that, of the providers shown to have middle mile access in Defiance County, limited last-mile access is available through their networks. Crown Castle and Independents Fiber Network, for example, service commercial entities exclusively, and Parallel Infrastructure's fiber is purpose-built to service wireless towers. Further, in comparing FiberLocator to the BroadbandNow data (see appendix A), there may be ISPs that provide residential fiber services have not provided that data to FiberLocator (as it is not a requirement that they do so).

Metro Fiber Networks (Middle to facilitate Last Mile)



[7] This data may or may not provide a full picture of the existing metro networks in the County. Providers are under no obligation to report Metro networks to Fiber Locator.

4. Digital Inclusion in Defiance County

A. Digital Divide Index

The Digital Divide Index or DDI primarily measures physical access/adoption and socioeconomic characteristics that may limit motivation, skills, and usage of broadband. Due to data limitations, it was designed as a descriptive and pragmatic tool and is not intended to be comprehensive. Rather, it should help initiate important discussions among community leaders and residents.

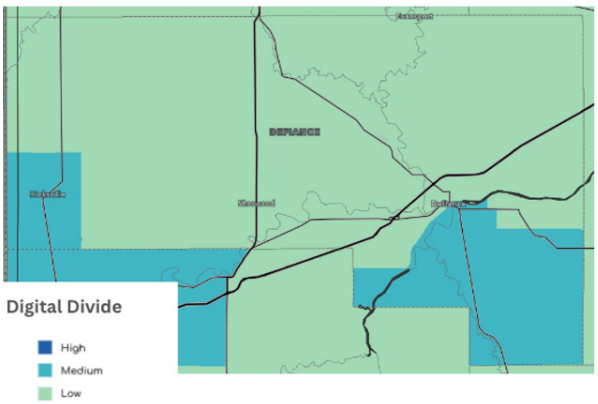
DDI scores range in value from 0 to 100, where 100 indicates the highest digital divide. It is composed of two scores, also ranging from 0 to 100: the infrastructure/adoption (INFA) score and the socioeconomic (SE) score. These two scores are combined to calculate the overall DDI score. If a particular county or census tract has a higher INFA score versus a SE score, efforts should be made to improve broadband infrastructure. If, on the other hand, a particular geography has a higher SE score versus an INFA score, efforts should be made to increase digital literacy and exposure to the technology's benefits13.

The Digital Divide index indicates the INFA score is higher than the SE score across all Defiance County Census tracts, indicating the need for broadband infrastructure improvements supersede the need for digital literacy throughout the County.

Digital Divide Index - Defiance County, OH

	INFA Variables					SE Variables					Digital Divide Index			
Census Tract	Median Download Speed (Mbps)	Median Upload Speed (Mbps)	Population Without Access to 100/20 Mbps	No Internet Access	No Computer Device	Less than HS degree	Poverty Rate	Age 65+	Disability Rate	Internet Income Ratio (IRR)	INFA	SE	DDI	
39039958500	99.3	11.5	100.0%	17.9%	8.90%	6.2%	18.0%	22.5%	16.9%	1.51	27.41	20.32	29.17	Low
39039958300	120.3	16.1	89.1%	21.4%	12.30%	11.4%	7.8%	17.00 %	11.20%	5.99	29.17	15.81	26.67	Moderate
39039958200	48.3	6.9	92.8%	15.1%	10.20%	7.3%	3.7%	13.7%	5.6%	1.67	27.09	9.62	20.75	Low
39039958600	117.6	12.3	100.0%	14.6%	15.30%	9.1%	25.0%	14.3%	10.5%	43.8	29.26	24.21	33.19	Low
39039958100	65.4	12.6	93.7%	11.9%	11.30%	2.7%	5.0%	16.3%	9.6%	1.62	26.13	11.240	21.47	Low
39039958900	137.5	13.9	93.1%	4.7%	5.00%	5.0%	4.7%	26.3%	9.8%	6.19	18.61	15.620	20.71	Moderate
39039958700	124.3	12.7	100.0%	17.0%	12.50%	9.3%	9%	24.8%	15.3%	8.93	28.57	20.05	29.60	Moderate
39039958800	123.2	13.1	98.9%	17.8%	11.70%	15.5%	18.1%	13.9%	16.2%	10.85	28.39	21.37	30.52	Moderate
39039958400	74.7	9.8	100.0%	15.0%	6.50%	9.1%	5.5%	16.8%	15.0%	10.33	25.29	16.92	25.38	Low

Digital Divide



The Digital Divide Index indicates a moderate digital divide in all of Hicksville and Highland Townships and in South and South Eastern Defiance.

Digital Distress

The inspiration for PCRD's Digital Distress metric came from well-known economic distress metrics that typically look at unemployment and income levels and PCRD's recognition that a similar metric for digital distress was not available. Existing variables look primarily at broadband access and speed tests. While these have advantages and disadvantages, digital distress paints a different picture of the digital inclusion landscape.

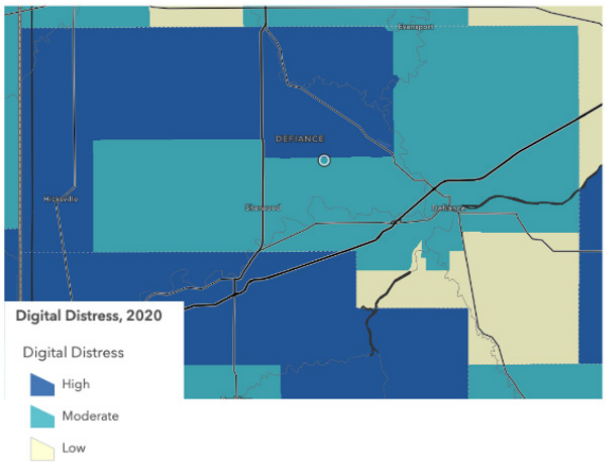
PCRD used four variables from the U.S. Census American Community Survey to populate the Digital Distress metric: 1) the percentage of homes with no internet access, 2) the percentage of homes using only cellular data, and 3) the percentage of homes relying on mobile devices only, and 4) the percentage of homes with no computing devices. Data was obtained for all U.S. census tracts and categorized into low, moderate, and high digital distress.[1]

PCRD's Digital Distress metric indicates high Digital Distress in Hicksville, Milford, Farmer, and Washington Townships.

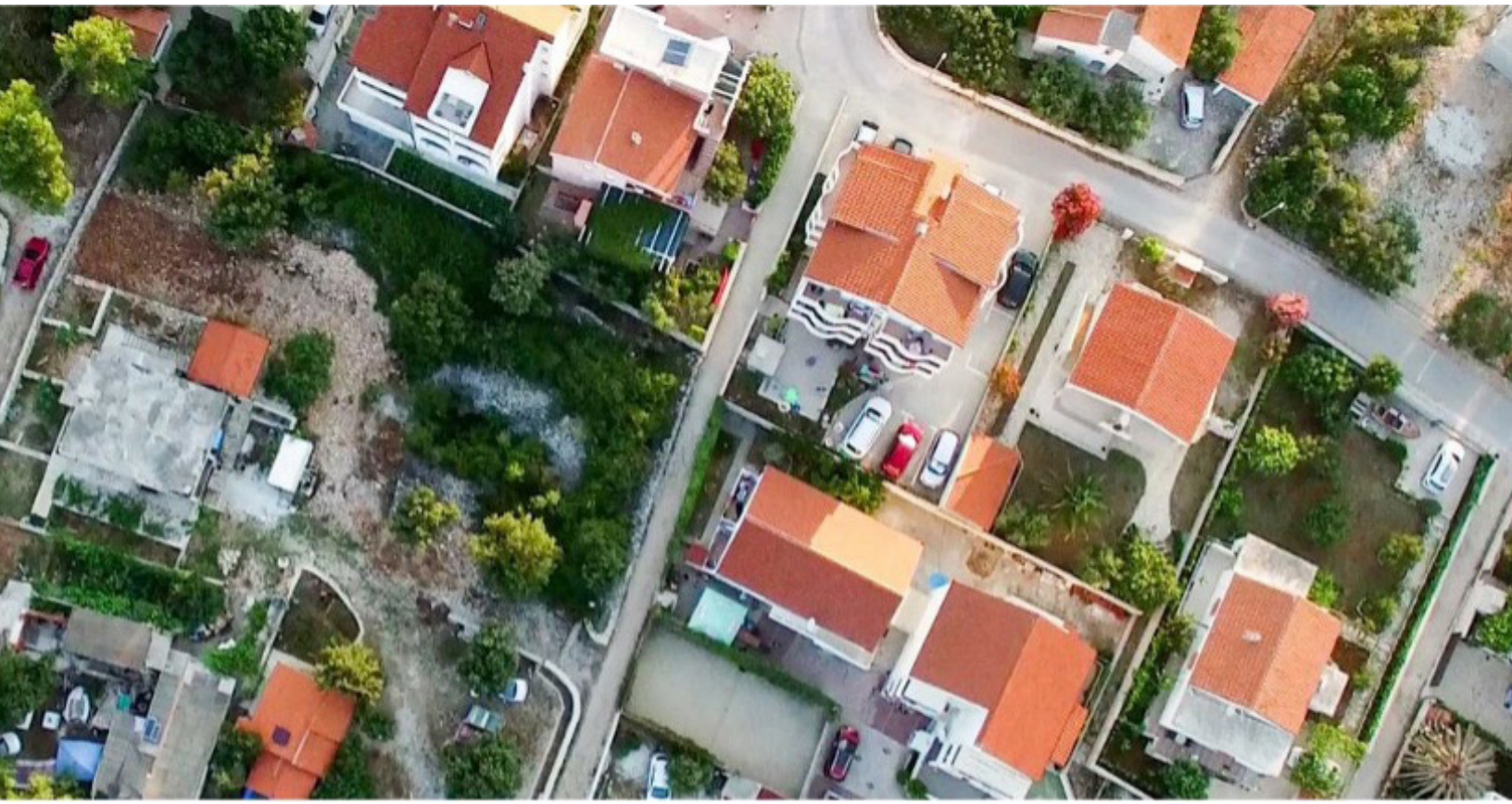
Digital Distress - Defiance County, OH

Census Tract	Households	Cellular Data Only	No Internet Access	Mobile Only	No Computer Device	Digital Distress
39039958500	1670	5.4%	17.9%	21.0%	8.9%	Moderate
39039958300	1606	7.2%	21.4%	21.6%	12.3%	High
39039958200	1687	14.0%	15.1%	13.8%	10.2%	High
39039958600	1618	8.3%	14.6%	12.7%	15.3%	Moderate
39039958100	1586	6.2%	11.9%	4.2%	11.3%	Moderate
39039958900	2116	6.4%	4.7%	12.9%	5.0%	Low
39039958700	1915	8.0%	17.0%	12.3%	12.5%	Moderate
39039958800	1525	4.4%	17.8%	11.1%	11.7%	Moderate
39039958400	1662	12.2%	15.0%	17.4%	6.5%	Moderate

Digital Distress



According to PCDR's Digital Distress metric, Hicksville, Milford, Farmer and Washington townships have a higher share of homes that either have mobile devices only or no devices at all and rely on cellular data only or have no internet access.



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3 Preliminary Network Design and Wireless Assessment

Objective

The high-level fiber network design provided herein serves the following two main purposes, both of which enable us to estimate the costs and investment required to construct such network:

1. Determining potential network paths using street centerlines, and
2. Obtaining the network length and number of connected points.

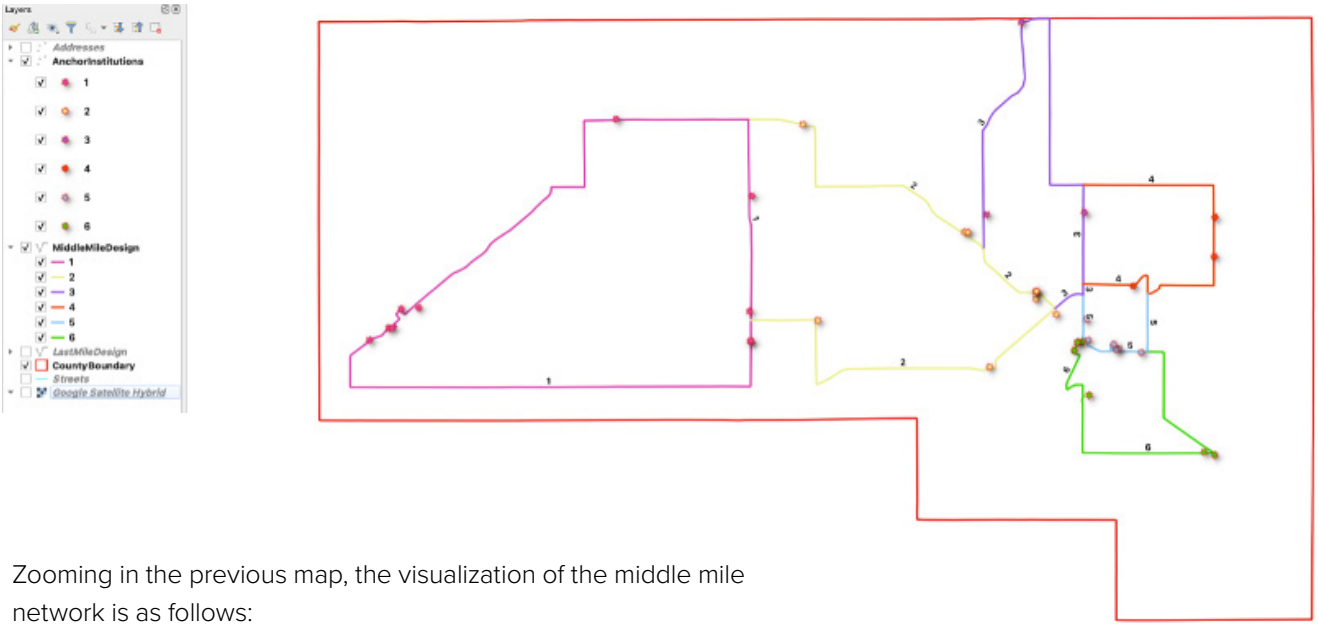
There are two layers of this network:

1. Middle mile network as the County's core network, connecting anchor institutions such as County- and municipal-owned buildings whose broadband connectivity is crucial;
2. Last-mile network connected to the middle mile network, connecting residents and businesses.

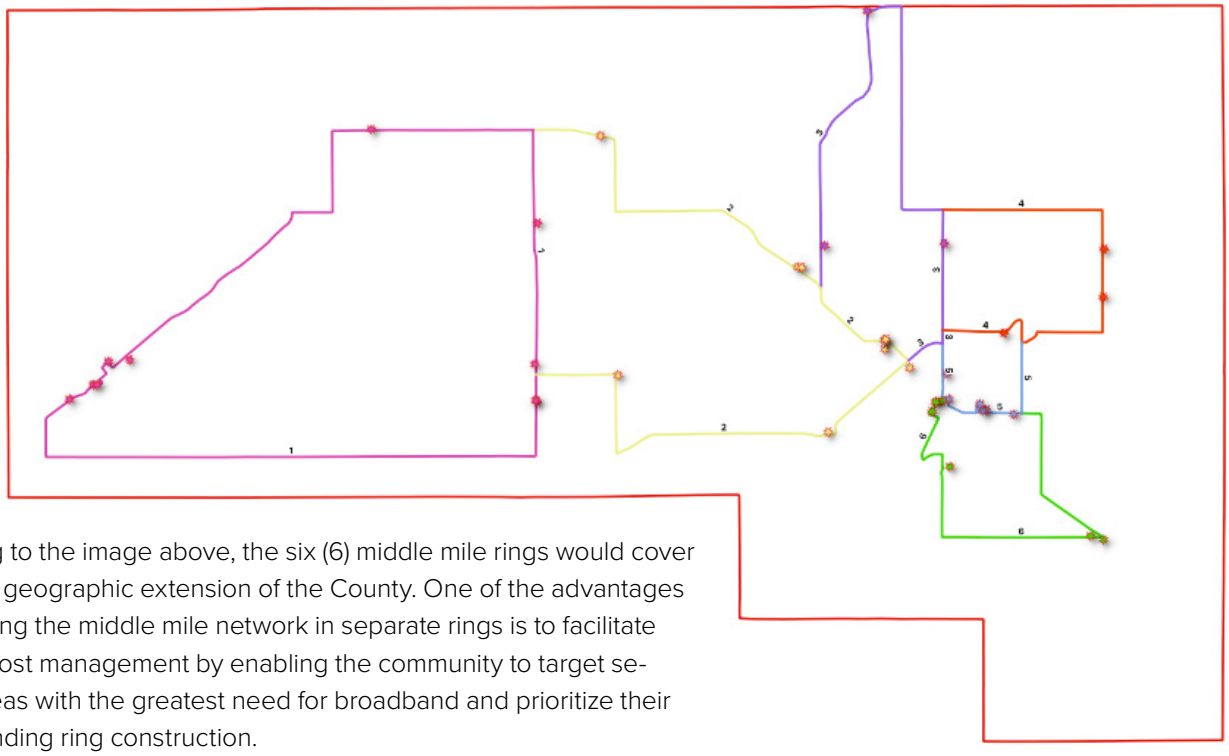
Based on the above, two preliminary designs have been generated for both middle mile and last-mile networks using the County's GIS (Geographic Information System) data and other data collection efforts by the Project Team.

1.) Preliminary Middle Mile Design w/ street ROWS

The image below shows a total of thirty-nine (39) anchor institutions that would be connected through six (6) closed network rings. The closed ring structure adds network redundancy and minimizes risk of connectivity interruptions. This ensures consistent connectivity for these institutions. Taking into consideration that this Middle Mile network will act as the core County broadband infrastructure, it is recommended that this fiber network be primarily underground, rather than aerial, in order to provide maximum protection from damage or interruption.

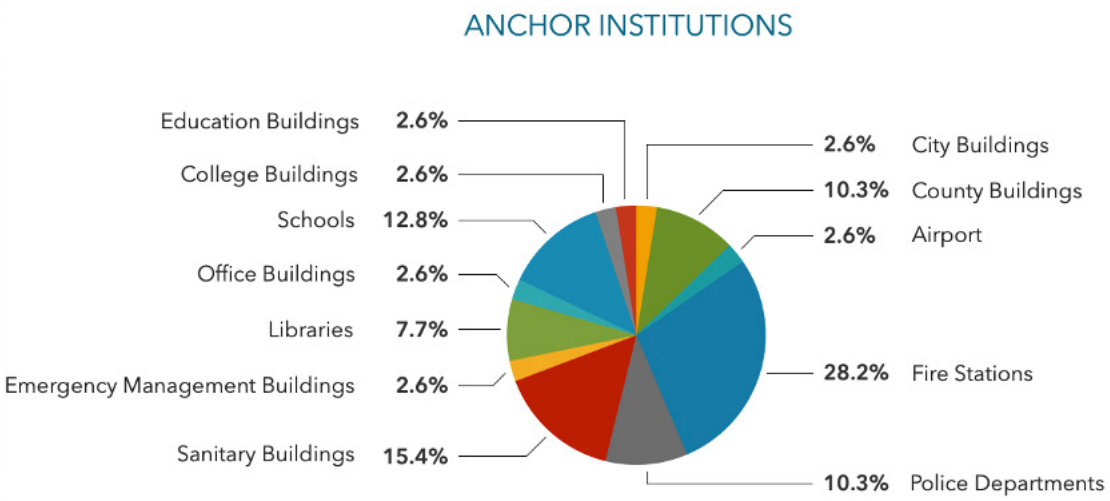


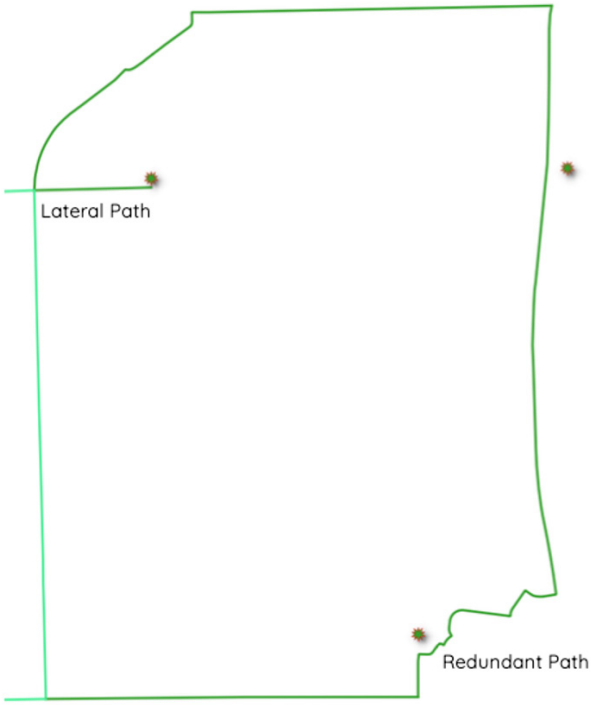
Zooming in the previous map, the visualization of the middle mile network is as follows:



According to the image above, the six (6) middle mile rings would cover the entire geographic extension of the County. One of the advantages of designing the middle mile network in separate rings is to facilitate budget/ cost management by enabling the community to target selected areas with the greatest need for broadband and prioritize their corresponding ring construction.

The percentage breakdown of the anchor institutions types connected on the rings is as follows:





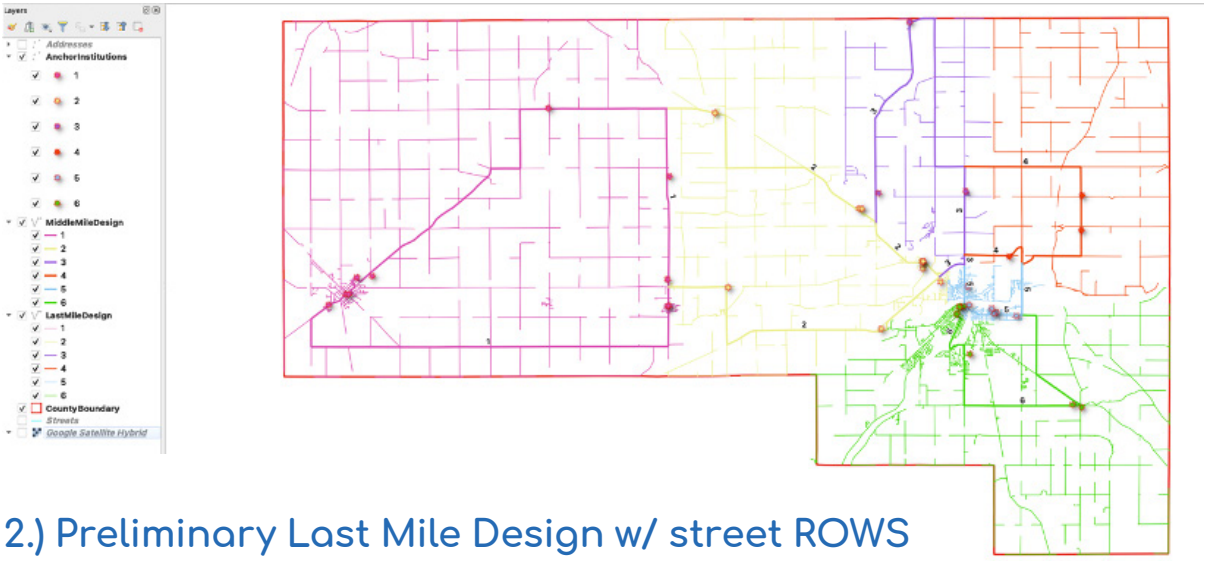
The anchor institutions have been categorized into two (2) types based on their location along the middle mile route (see image below):

- **Redundant path:** The anchor institution is connected within the main middle mile route guaranteeing its constant connectivity.
- **Lateral path:** The anchor institution is connected to the main middle mile route through an additional lateral path. Connectivity cannot be ensured if there is an interruption in the lateral path as it is not created in a similar ring structure.

In the case of the preliminary middle mile design presented to Defiance County, all anchor institutions are connected to a redundant path securing their connectivity (see Appendix B).

The table at right shows the middle mile network length breakdown per ring with each ring's corresponding number of anchor institutions:

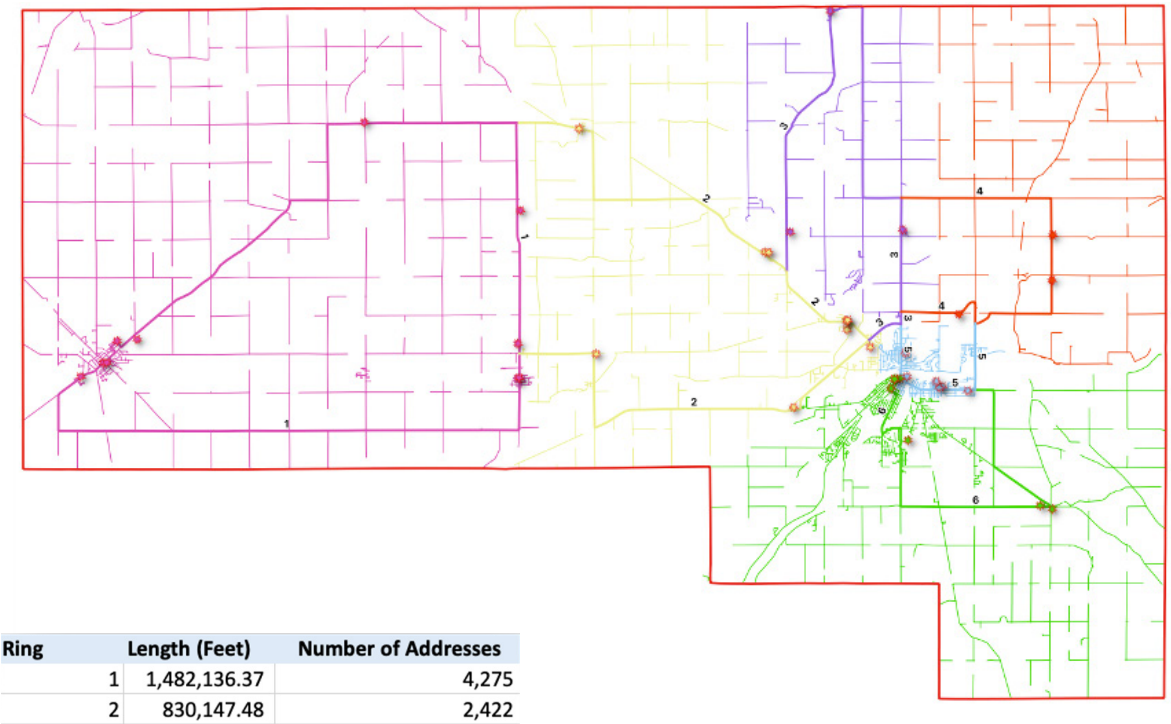
Ring	Length (Feet)	Number of Anchor Institutions
1	198,610.93	10
2	132,255.40	10
3	97,575.54	3
4	61,585.44	3
5	29,930.68	6
6	67,937.24	7
Total	**587,895.23**	**39**



2.) Preliminary Last Mile Design w/ street ROWS

Defiance County residents and businesses (total of 18,903 addresses widely spread throughout the entire county extension) would be connected in the preliminary last-mile network design. This last-mile network is projected to be attached to the middle mile network (i.e., the primary County broadband network). Hence, every middle mile ring shown above has a corresponding last-mile design, as depicted in the image below. Proceeding this way for the last-mile design, network construction can be divided into phases for budgetary and grant application purposes.

Zooming in the map above, the following image is obtained:



Ring	Length (Feet)	Number of Addresses
1	1,482,136.37	4,275
2	830,147.48	2,422
3	360,405.61	1,155
4	542,504.76	834
5	198,495.05	3,033
6	1,053,048.93	7,184
Total	**4,466,738.20**	**18,903**

The table at left shows a summary of the number of addresses (residential and commercial) together with their corresponding last-mile network length per middle mile ring:

Wireless Assessment

Introduction

Lit Communities partnered with PNe to provide a **Fixed Wireless Assessment** for the Defiance County Broadband study.

PNe conducted a technical and cost analysis of fixed wireless broadband options to reach areas in Defiance County, Ohio unserved by broadband. Unserved areas are defined as areas equal to or less than 25 Mbps download and 3 Mbps upload.

We focused primarily on **Citizens Broadband Radio Service (CBRS)** in our design and engineering model, along with other emerging, available spectrum and technologies that can deliver broadband performance.

This report documents PNe's analysis of fixed wireless broadband solutions using the available spectrum and technologies on a **county wide basis**, using available mapping and other resources, as well as information provided to us from Lit Communities and Defiance County, Ohio. PNe also relied on their personal experience in their deployment and operations of fixed wireless CBRS LTE networks.

An overview summary, of available **CBRS Spectrum** that also describes the challenges and benefits of that spectrum. We relate that information to the fixed wireless network characteristics, of a CBRS LTE wireless network design that we are utilizing in our work for this report. The RF propagation maps of our design are shown in the full report in Appendix G..

We have also captured the associated capital costs, at high level, and the major factors that impact those costs.

Key Findings

The primary cost driver for a fixed wireless broadband solution can be spectrum, predominantly due to its technical characteristics. The farther a certain radio frequency can reach, the more locations it can cover lowering overall cost. The lower the frequency, the better it will penetrate or go around obstacles. Other cost drivers include the power authorized by the FCC for users in the band, the density of locations within a given coverage area, tower availability (building a new tower adds expense), tower lease costs (for available towers), and the service adoption rate.

The Educational Broadband Service (EBS) technology and spectrum is the best technological and financial fit for a fixed wireless broadband network. Specific channel groups availability in the county would need to be determined if available for sale, lease and/or stakeholder agreement.

The technological fit is due to the higher allowed operational power and the superior signal propagation, including through foliage and over challenging terrain. EBS spectrum is now available for purposes other than education, and many entities, such as mobile carriers, are taking advantage of its availability. EBS spectrum is allocated in 20 MHz "channel groups"; one channel group is sufficient in providing broadband service.

Due to the aforementioned technological advantages over other spectrum such as CBRS and unlicensed 5 GHz, EBS is also a more cost-effective spectrum solution. EBS's superior signal propagation translates to more locations served from each tower (or other vertical structure used for service distribution in an area) and higher speeds.

This study used CBRS and/or unlicensed 5GHz for the propagation models included in this report.

4 Construction Ride Out (CRO) & Make Ready Engineering Analysis (MREA)

Purpose:

The purpose of the CRO/MREA is to gain a better understanding of the costs associated with make-ready engineering and the environmental split. These findings factor into the financial model, specifically the costs of the network build-out.

Methodology:

Lit Communities virtually assessed a random sample of routes in urban, suburban and rural areas of Defiance County. During the desktop construction ride out, a high-level visual check of poles for usability was performed on these sample areas for the following criteria:

- Number of attachers, specifically more than four attachers in the communication space
- Overall quality and condition of poles on the route
- Amount of make ready construction in the power space

The network routes that matched these criteria were examined in detail to further determine if an underground alternative is more feasible.

Results and Recommendations:

Most suburban areas have pole lines delivering power, telephone and broadband. The high volume of traffic on these poles will, in many cases, precipitate higher make-ready costs in order to safely prepare the poles for additional lines.

Many rural areas of the County have shorter poles. Shorter poles tend to have less weight capacity, meaning that complete pole replacement may be necessary for construction. Although there is an elevated make ready cost due to overburdened poles, in many cases, it will still be less expensive than going underground.

The best way to control costs after project selection is to vet the best path in a detailed engineering design. Coordinating with utilities upfront to determine and negotiate any make-ready costs for aerial construction will help eliminate extemporaneous costs. Below are estimated make-ready costs based on Lit's CRO/MREA and conducting their virtual desktop review. These cost assumptions have been worked into Lit's financial modeling.

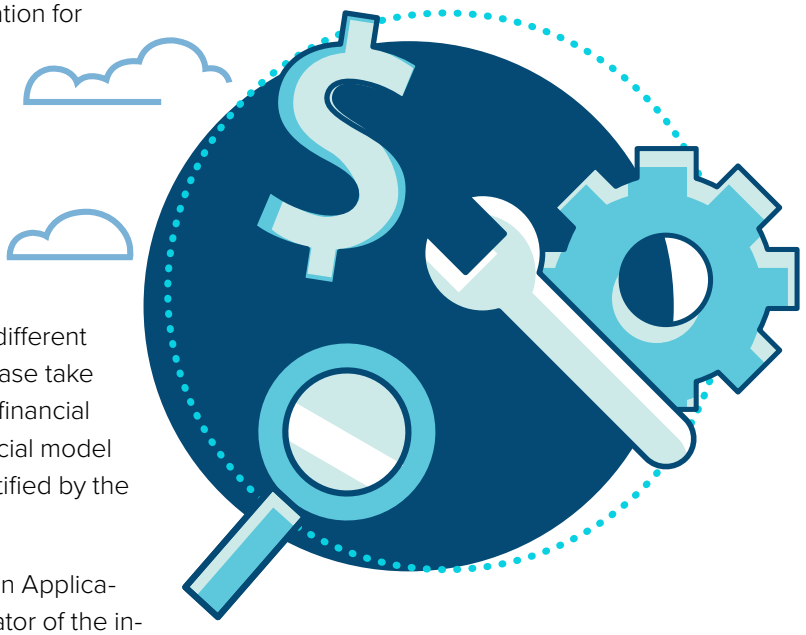
Estimated Make-Ready Averages:

Estimated Make-Ready Averages		
	Avg. Cost per Mile (Estimated)	**Avg. Cost per Foot** (Estimated)
Residential	$30,000	$5.68
Suburban	$25,000	$4.73
Rural	$10,000	$1.89
Industrial	$15,000	$2.84

5 Financial Models

Lit completed two 20-year financial models for a countywide middle mile network and one financial model for a last mile network based on the results of the middle and last mile preliminary designs completed. The financial estimates serve as the backdrop for this plan and inform recommendations made as well as next steps the County can take to continue the project. We anticipate the estimates to continue to evolve and become more refined as the project progresses through its multiple phases.

Key metrics used from the designs to inform both financial models are aerial and underground lengths and number of road miles. Other data points incorporated into the financial models include area demographics (population, income, number of households). Estimates are based on industry standards for pole count, span factor, and time duration for engineering and construction. Debt and equity assumptions with debt amounts, terms,interest rates, payments and required equity investment are included with equity returns provided for the last mile models.



Take rate assumptions of 40%, 70%,and 80% are built into the last mile models as a variable with a toggle that allows for the County to select a different take rate to see how the model would change. A base take rate of 70% was used for the County wide last mile financial model. The take rate used for the middle mile financial model is 100% as it includes all 39 anchor institutions identified by the County during this project.

The revenue estimates were built out using an Open Application Model where there is a single owner and operator of the infrastructure of the last mile network (fiber to the home/business). The middle mile network will provide connectivity to the last mile network as well as provide service to the anchor institutions throughout the County. Service offerings including internet, voice, TV, telehealth, and smart home applications offered over the last mile network are reflected as revenue opportunities for the County on a per subscriber basis.

1. Cost Estimate #1:

Defiance County Middle Mile Financial Model w/Street ROWs

a. This table shows the key demographic and design assumptions that informed this middle mile preliminary design

Defiance County Assumptions		
Demographics		
Population	38,286	
Median HH Income	$62,110	
Median Age	40	
Demand Points		
Residential Demand Points		
Business Demand Points	0	
Anchor Institutes/City Facilities	39	
Total Demand Points	**39**	
Right of Way Preliminary Design Results		
Aerial Length ROW	378,790	65%
Underground Length ROW	203,964	35%
Existing Aerial ROW		
Existing Underground ROW		
Total ROW Length (Feet)	582,754	
Total ROW Length (Miles)	110	
Additional Network Assumptions		
Span Factor	150	
Estimated Pole Count	2,525	
Cabinets or Shelters	0	
Engineering Duration (months)	12	
Make Ready Duration (months)	12	
Construction Duration (months)	12	
Financial Duration (months)	240	
Take Rate Duration (months)	24	
Instances (Each)	1	

Anchor Institutes and Ring Mileage

Market	Anchor Institutes	Ring Mileage
Rings		
1	10	37.62
2	10	25.05
3	3	18.48
4	3	10.70
5	6	5.66
6	7	12.86
	39	110.37

b. This table provides a summary of all capital expenditures required for the middle mile network, recurring expenses and shows the revenue potential as well as the total investment required to build:

All Rings (6)	
Capital Expenditures	
Assessment	$0
Engineering (Low Level Design)	$1,239,976
Construction	$10,278,026
Operational Carry during Construction	641,875
Total Capital Expenditures and Investment Required to Complete	$12,159,877
Recurring Expenses	
Operatons and Maintenance-20 years	$2,040,961
Subtotal	$2,040,961
Potential Revenue	
FTTH Partner- 20 years	$14,118,490
Services- 20 years	$10,139,625
Dark Fiber Leases- 20 years	$2,374,833
Total Revenue	$26,632,948
Total # of Residential Units	18,903
Total # of Anchor Institutions	39

c. The below table provides capital expenditures for each of the six rings designed for the county-wide middle mile network:

Capital Expenditures	Ring 1	Ring 2	Ring 3	Ring 4	Ring 5	Ring 6
Assessment	$0	$0	$0	$0	$0	$0
Engineering (Low Level Design)	$252,189	$214,215	$194,367	$170,863	$155,637	$177,388
Construction	$2,898,976	$1,978,678	$1,497,663	$928,059	$559,061	$1,086,201
Total Assessment, Engineering & Construction	$3,151,166	$2,192,893	$1,692,029	$1,098,922	$714,698	$1,263,589

2. Cost Estimate #2:

Defiance County FTTH (Fiber to the Home) Last Mile Financial Model

a. This table shows the key demographic and design assumptions that informed this fiber to the home last mile preliminary design:

Defiance County, OH Design Assumptions			
Demographics			
Population	38,286		
Median HH Income	$62,110		
Median Age	40		
Demand Points			
Residential Demand Points	18,903		
Business Demand Points	159		
Total Demand Points	**19,062**	233	Property footage check
Right of Way Preliminary Design Results			
Aerial Length ROW	2,881,611	65%	
Underground Length ROW	1,551,636	35%	
Existing Aerial ROW	0		
Existing Underground ROW	0		
Total ROW Length (Feet)	**4,433,247**		
Total ROW Length (Miles)	840		
Additional Network Assumptions			
Span Factor	200		
Estimated Pole Count	12,967		
Cabinets or Shelters	10		
Engineering Duration (months)	24		
Make Ready Duration (months)	24		
Construction Duration (months)	36		
Financial Duration (months)	240		
Take Rate Duration (months)	48		
Instances (Each)	1		

Residential Units and Auto-Design Mileage

Serving Area	Residential Units	Design Mileage	Homes Per Mile
1	4,275	280	15
2	2,422	156	16
3	1,155	68	17
4	834	103	8
5	3,033	36	84
6	7,184	197	36
	18,903	840	177

b. This table provides a summary of all capital expenditures required for the last mile network, recurring expenses and shows the revenue potential as well as the total investment required to build:

Capital Expenditures	
Assessment	$0.00
Engineering	$4,082,259
Construction	$70,665,251
Total	$74,747,510
Recurring Expenses	
Operations and Maintenance - 20 Years	$24,306,095
Technology Management - 20 Years	$19,386,250
Subtotal	**$43,692,345**
Potential Revenue	
Internet and Phone - 20 Years	$192,495,022
Additional Smart Home Services - 20 Years	$2,098,054
Total Investment Required to Complete	**$83,916,387 includes revenue**
Cost Per Household Passed	**$3,831**
Equity KPI	**$1,300**
Gap Per Household Passed	**$2,531**
Total Gap Funding Needed	**$48,245,922.00**

c. The cost per household passed is what most private Internet Service Providers ('ISP') use as a Key Performance Indicator ('KPI') to justify the capital investment to complete the network infrastructure built in a certain geography or service area. Some larger or national ISP's will only go to areas where the cost per household passed is between $700-$900. Other smaller or regional ISP's will go up to ~$1,300 or higher- this was used to evaluate the gap that must be bridged financially to complete a full public, private, partnership for a fiber network that passes every address point in the County.

A partnership creation with one or more local ISPs could help the County achieve its goal of enhancing connectivity more cost effectively by utilizing existing infrastructure which would decrease overall expenditures and any required investment.

The models indicate the Total Capital Expenditure and Investment Required to Complete a build out of a county wide middle mile network is estimated at $12,159, 877. A partnership creation with one or more local ISPs could help the County achieve its goal of enhancing connectivity more cost effectively by utilizing existing infrastructure which would decrease overall expenditures and any required investment.

Data from the financial models combined with data from the Market Service and Incumbent Analysis on unserved and unserved areas of the County, allows the County to prioritize and develop a strategic plan for the next phase of this work. As part of subsequent phases of the project, a Request for Proposals or Request for Information can be developed and shared with the local providers — this would help the County identify the best partner(s) to move forward with to accomplish its objectives. These items are covered in more detail under Next Steps recommendations.

6 Community Survey

The Defiance County Broadband Survey was launched on April 15th, 2022 and was made available for residents and commercial entities. On September 23, 2022, the 416 responses, comprising 395 residents, 5 government, and 16 businesses, were analyzed. A complete set of all data from the Survey can be found in Appendix F.

The survey responses were categorized into 15 geographical service zones:

Considering Defiance County's population of approximately 38,807 residents, this response rate offers a 95% statistical confidence level that the data provides an accurate representation of the county as a whole.

Defiance County, OH Broadband Survey	
Service Zone:	**# of Responses:**
Adams Township	12
Hicksville Township	15
City of Defiance	153
Defiance Township	13
Delaware Township	16
Farmer Township	12
Mark Township	12
Milford Township	11
Noble Township	36
Richland Township	18
Tiffin Township	55
Washington Township	30
Village of Hicksville	8
Village of Sherwood	4
Highland Township	21
Total:	**416**

The survey captured data and analytics in the following key areas:

1. Opinions on a municipal network and how important it is that Defiance County is involved in bringing better broadband to residents and businesses

a. Across the service zones, a combined 71% indicated that they were likely to sign up for another internet service if it was available, with an additional 24% indicating that they would consider signing up for another service. In total, 95% of respondents would or would consider signing up for another service, if it was available.

b. Another key indicator of support for new/additional options can be seen by the majority of respondents (90%) expressing the importance or extreme importance of Defiance County addressing broadband.

2. Satisfaction with providers (speed, reliability, price)

a. Of the 394 respondents that currently have internet service, the majority expressed general satisfaction with its reliability and speed.

b. 53.3% of respondents are dissatisfied with the price they currently pay, ranging from somewhat, mostly, to very dissatisfied.

3. Measurement of current internet speeds via a speed test[1]

a. 5.5% of respondents reported that they do not have an internet connection of any type. Evaluated by service zone, 50% of survey respondents residing in the Village of Sherwood, 15% residing in Defiance Township, and 15% residing in Farmer Township reported having no internet connection of any type. A complete list of zones with respondents that reported no internet connectivity:
   i. City of Defiance 2%
   ii. Hicksville Township 7%
   iii. Tiffin Township 13%
   iv. Highland Township 5%
   v. Defiance Township 15%
   vi. Village of Sherwood 50%
   vii. Milford Township 9%
   viii. Farmer Township 15%
   ix. Washington Township 13%

b. 7% of respondents with internet connectivity produced speed tests that do not meet the current FCC definition of 25 Mbps download/ 3 Mbps upload.

c. Only 9 of the completed speed tests had symmetrical download and upload speeds of 100 Mbps, however 83 had download speeds of 100 mbps and faster.

4. Comparison of respondents' actual vs advertised speeds

a. Of the survey respondents who reported subscribing to a service of 100 Mbps download or greater, 21.43% had speed tests with download speeds below 100 Mbps.

5. Data on internet service providers currently serving Defiance County

a. Charter Communications is the dominant provider in Defiance County, serving 38.1% of respondents.

b. Metalink and its sister companies hold the second highest market share, serving 33.3% of respondents.

6. Comments from respondents:

The comments from respondents showed several key trends:

- Nearly all comments remarked on price and/or accessibility;
- Comments around accessibility emphasized rural areas; and
- In general, comments on accessibility correlated with either price, reliability, and/or speed.
- Also of note is the remaining dependence on landlines, which is increasingly uncommon for residences in the modern day.

These findings were further validated by a random sample analysis of 101 comments. The most common topic mentioned was price and/or the affordability of service, with access to service as a secondary trend of discussion. Samples from this data set are on the following pages:

[1] Broadband speed tests depict the level of service that a household is receiving based on their selected package. However, it is important to note that enhanced speed tiers may be available to a household, but the homeowner elects not to subscribe. In such circumstances, affordability programs, as opposed to infrastructure programs, may be most needed to bridge the digital divide.

Comment Trend Analysis
Random Sample of 101 Comments

Affordability	Submission ID: Q0000475	Submission ID: Q0000362
	Discounted rates for seniors (help them keep connected with the world, discounted rates for low income families to help the kids achieve at school. Take the profit edge off the availability as this is an important service today just like water, electricity, garage, etc.	It would be better if the price was better. It used to be a privilege and a want to have internet. Now it is needed for everyday activities including school/homework. We used to be able to go to McDonald's and use their wifi, but with staffing issues many inside lobbies are once again closed. And many places are closing early
	Submission ID: Q0000321	Submission ID: Q0000311
	Needs to be available for those outside of town (rural areas) and fees farmers can afford.	a decent speed without spending $100 to get it. My speed is not the best but it is currently reasonably priced for a retired person on a fixed income.
Speed	Submission ID: Q0000352	Submission ID: Q0000418
	We have internet through our phone lines....super slow and signal is so bad the wifi always drops. We need to get into 20th century, but phone line is the only thing available to us.	Honestly don't know much about the technical aspects of internet, just wish it was faster and more reliable
Reliability	Submission ID: Q0000309	Submission ID: Q0000347
	Having a reliable internet connection for my Etsy business	Be able to surf the web, watch internet TV or stuff like Netflix without interruption or not connecting.
Accessibility	Submission ID: Q0000407	Submission ID: Q0000344
	If we could get the service. Our internet is painful. Family members have to take turns.	We are unable to get any internet at our house
Competition	Submission ID: Q0000491	Submission ID: Q0000245
	We need competition in this area. I am tired of not having a choice when my provider decides to up the price of what I am paying. We have also had our Internet go out and it takes days to get a service call. Our provider once unplugged our line at the box to set up another house leaving us without internet and it took them three days to come and plug us back in even when it was their error. We work from home so this was a huge issue. Because there is no competition, they don't have to offer great customer service. There is also no local line to call. Unfortunately, the competition doesn't offer the speed we need and/or we don't want equipment mounted on our home.	More provider competition in our area.

Comment Trend Analysis
Random Sample of 101 Comments

Fiber Demand	Submission ID: Q0000551	Submission ID: Q0000323
	More reliable service with more competitive pricing that doesn't continuously bug customers to upgrade and add on other services, so that we don't have to rely solely on one semi-reliable provider. Fiber would be super awesome, too, and public WiFi downtown would be amazing, or even public WiFi areas throughout the county.	Fiberoptic, even paying the same for fiber as we do now, it's so much faster. Our daughter has fiber and it's great.
Poor Cell Service and/or Wireless Issues	Submission ID: Q0000429	Submission ID: Q0000398
	I am using a hot spot for internet and have to have my phone everytime I use it. We live north of Defiance about 2 miles on 66 and cannot get any kind of service. Metalink says trees are in the way for there towers, Spectrum wants $10,000 to bring it down to us, Century link says wires were cut under the road and out in our driveway and want us to pay $1300. to repair it even thou it wasn't is who cut them. Direct TV and Frontier says they don't have any service in our area. We had Comlink but they were very expensive and only worked half the time so we dropped them. With the hot spot I have the phone so my husband cannot use the internet without me being here. Being so close to town I cannot believe we have this much trouble.	Access to 5g, can not talk on the phone while driving throughout the county because the call will be dropped
Upload Speed	Submission ID: Q0000410	Submission ID: Q0000449
	Key is to ensure reliability when multiple devices in a household are streaming	Better tv streaming
Remote learning / Work	Submission ID: Q0000324	Submission ID: Q0000345
	If we were able to stream from multiple devices. I also was unable to work from home during COVID and had to go into the office by myself.	The rural area where I reside is in need of internet !! The kids needing it for school and can?t get it at home ! How our central local kids made it through the Covid , no in school classes I don?t know ,

7 Partner Engagement

Summary

Lit Communities conducted two focus groups with public and private sector leaders, as well as a broadband town hall. Through these sessions, Lit Communities educated stakeholders on the study, discussed the impacts that commercial and residential broadband (or lack thereof) has on individuals and organizations, and identified potential partnerships. The areas of focus included Business and a Town Hall for the public.

Lit Communities educated stakeholders on the study, discussed the impacts that commercial and residential broadband (or lack thereof) has on individuals and organizations, and identified potential partnerships.

Business Focus Group Participants		
Organization	**Name**	**Title**
MetaLink	Fernando Torres	Operations Manager
MetaLink	Darrell Handy	PR & Business Partnerships Specialist
Office of Lt. Governor Jon Husted	Lu Cooke	Northwest Regional Liaison
Maumee River Basin Watershed Project	Dr. Mark Zeller	Field Research - Smart Technology & Great Lakes Watershed Sustainability

Business Focus Group Key Takeaways:

- Local ISP MetaLink sees emerging need for infrastructure to support IoT Smart Sensors for volumetric monitoring, smart City/County and Agricultural applications
- Defiance Economic Development sees broadband gaps as a barrier to recruiting new businesses to diversify the Defiance County economy

Broadband Townhall Participants	
Name	**Township**
Community Member 1	Noble Township
Community Members 2 & 3	Washington Township
Community Members 4 & 5	Washington Township
Community Members 6 & 7	Noble Township
Community Members 8 & 9	Tiffin Township
Community Member 10	Noble Township
Community Member 11	Noble Township
Community Member 12	Noble Township

Broadband Town Hall Key Takeaways:

Topics surfaced by Broadband Townhall participants included:

- Limited or no connectivity at their residence
- Wireless connectivity issues primarily due to interference from trees and other terrestrial sources
- Accessibility gaps impacting children's education (per their experiences responding to the COVID-19 pandemic)
- Limited ability for small businesses to perform daily operational tasks due to connectivity
- A desire for the overall benefits of residential broadband connectivity, including streaming, shopping online, utilizing telemedicine, paying bills, etc.

8 Grant Services

Purpose and Scope:

To support the Defiance County CA findings and recommendations, we evaluated federal and state broadband funding programs to identify programs that can be pursued to support aspects of the network including, Middle Mile, Last Mile and support initiatives related to economic development, telehealth, and emergency response/preparedness.

Methodology and Terms:

- Lit screened County specific criteria against our database of active federal grants for eligibility based on factors such as location, per capita income, unemployment rate, low to moderate income data, broadband access, and rural designation status.
- Programs deemed applicable are identified as “Primary Matches”.
- Programs that partner entities can apply for are identified as “Secondary Matches”.
- Results and Recommendations:
  - Defiance County is eligible for 12 Primary Matches and 18 Secondary matches (see attached Primary Grant matrix)
  - Key programs to consider:
    - U.S. Treasury - Capital Projects Fund (State of Ohio’s allocation is $268mm)
    - US Department of Agriculture - ReConnect Program
    - Department of Commerce (NTIA) - Broadband Equity, Access and Deployment (BEAD)

Section I. Federal and State Broadband Grant Program Research

Federal Broadband Grant Program Eligibility

Lit Communities maintains a database of nearly 60 federal grant programs that fund aspects of broadband deployment across 15 federal agencies. Our team screens each of those programs for applicability to the County and identifies Primary Matches and programs that partner entities can apply for which are identified as Secondary Matches.

Federal Broadband Grant Program Matrix (Primary)

Specific to Defiance County, there are 12 Primary Matches (see attached “Primary Matches Matrix”). Lit has prepared a matrix with high-level details on each program including;

- Maximum funding amount,
- Annual program capacity,
- Eligible applicants,
- Eligible activities and
- Matching requirements.

Federal Broadband Grant Program Synopses

For each Primary Match, Lit has prepared grant synopses with additional information including:

- Program purpose and overview
- Application deadlines
- Expanded list of eligible project activities
- Special requirements
- Agency contact information

Synopses were prepared for the following federal and state agencies and programs:

1. United States Department of Agriculture - Rural Development [8.1]

- Community Connect Grant Program [8.2]
- Distance Learning and Telemedicine Grant Program [8.3]
- ReConnect Program [8.4]
- Rural Broadband Access Loans and Loan Guarantees [8.5]
- Telecommunication Infrastructure Loans and Loan Guarantees [8.6]

2. Department of Commerce - National Telecommunications and Information Administration (NTIA) [8.7]

- Broadband Equity, Access and Deployment (BEAD) Program [8.8]
- Middle Mile Grant Program [8.9]

3. United States Department of Housing and Urban Development {8.10]

- Community Development Block Grant (CDBG) – Non-Entitlement Communities [8.11]
- Choice Neighborhoods – Planning [8.12]
- Choice Neighborhoods – Implementation [8.13]

4. United States Department of Transportation [8.14]

- Rebuilding American Infrastructure With Sustainability and Equity (RAISE) Grant Program [8.15]

5. United States Department of Homeland Security - Federal Emergency Management Agency [8.16]

- Building Resilient Infrastructure and Communities [8.17]

Federal Broadband Grant Programs (Secondary)

In addition to the federal broadband grant programs listed as Primary Matches, Berks County may consider seeking additional funding opportunities through the following agencies and programs with other eligible applicants:

1. United States Department of Education

- Governor's Emergency Education Relief Fund (GEER)
- Elementary and Secondary School Emergency Relief Fund (ESSER)
- Higher Education Emergency Relief Fund
- Impact Aid Programs
- Promise Neighborhoods Programs
- Rural, Low-Income School (RLIS) Program
- Small, Rural School Achievement (SRSA) Program
- Title I, Part A. Improving Basic Programs Operated by Local Education Agencies Program
- Title III, Part A. Strengthening Institutions Program
- Title IV, Part A. Student Support and Academic Enrichment Program

2. United States Department of Labor – Employment and Training Administration

- Workforce Development in Telecommunications Sector: Apprenticeship Investments in Support of Broadband and 5G

3. United States Department of Treasury – Office of the Comptroller of the Currency (OCC)

- Community Reinvestment Act (CRA) Program

4. Federal Communications Commission – Universal Service Administrative Company

- E-Rate (Schools and Libraries) Program
- High Cost Program (CAF, RDOF & 5G Fund)
- Rural Health Care Program

5. National Science Foundation (NSF)

- Campus Cyberinfrastructure (CC*) Program
- Smart and Connected Communities (S&CC) Program
- Spectrum and Wireless Innovation Enabled by Future Technologies (SWIFT) Program

Section II. Evaluation of Project Opportunities

Lastly, Lit identified potential grant project opportunities ranging from the Middle Mile to Last Mile and related economic development, telehealth, and emergency response efforts and matched them with programs from the Primary Matches matrix. The grant research deliverable (Appendix E) can be used as a guide and reference when pursuing grant opportunities and accompany this business plan as a separate attachment.

Project	Needs	Agency	Potential Funding Program(s)
Middle Mile (Backbone)	Planning, Design, Construction & Equipment	DHS-FEMA USDA-RD USDOC-NTIA	• Building Resilient Infrastructure and Communities (BRIC) • ReConnect Pilot Program • Rural Broadband Access Loan and Loan Guarantees • Broadband Equity, Access, and Deployment (BEAD) Program • Enabling Middle Mile Broadband Infrastructure Program
Last Mile (FTTP)	Planning, Design, Construction & Equipment	USDOC-NTIA USDA-RD USDHUD	• Broadband Equity, Access, and Deployment (BEAD) Program • ReConnect Pilot Program • Rural Broadband Access Loan and Loan Guarantees • Telecommunications Infrastructure Loans and Loan Guarantees • Community Development Block Program • Choice Neighborhoods - Implementation • Choice Neighborhoods - Planning
Telehealth Economic Development Emergency Response Distance Learning	Planning, Design, Construction & Devices	FCC-USAC USDA-RD USDHUD DHS-FEMA	• Rural Health Care Program • E-Rate (Schools and Libraries) Program • Community Connect Grant Program • Distance Learning and Telemedicine Grant • ReConnect Pilot Program • Rural Broadband Access Loan and Loan Guarantees • Community Development Block Program • Choice Neighborhoods - Implementation • Choice Neighborhoods - Planning • Building Resilient Infrastructure and Communities (BRIC)

ACRONYMS:
DHS - FEMA: Department of Homeland Security - Federal Emergency Management Agency
FCC - USAC : Federal Communications Commission - Universal Service Administrative Company
USDA-RD : United States Department of Agriculture - Rural Development
USDOC-EDA : United States Department of Commerce - Economic Development Administration
USDOC-NTIA: National Telecommunications and Information Administration
USDHUD : United States Department of Housing and Urban Development

Section III. Preparing for Grant Funding Opportunities

Through our experience applying for and obtaining financial assistance, we have consistently observed that communities who have the proper engineering and technical information required to apply completed ahead of time are most prepared, confident, and competitive when seeking grant funding. Often, federal agencies only provide between 45 - 60 days for application submission which leaves very little time to begin these studies and assessment while the application period is open.

Therefore, if Defiance County is strongly interested in seeking grant funding to address its broadband infrastructure and accessibility gaps, we recommend that the County conduct these efforts as soon as possible so they are prepared and ready for future funding opportunities. Additionally, prior to applying for grant funding, it is strongly recommended that Defiance County coordinate closely with the Ohio Broadband Expansion Authority and other key stakeholders to ensure that the proposal is aligned with State planning efforts and to include the County's needs with respect to project costs to reach unserved and underserved areas. It is also important to note that partnerships with related stakeholders can possibly strengthen potential applications for funding, however more weight is given to partnerships that have been formally established prior to applying for funding. Lastly, due to the varying amount of local matching funding required to pursue these opportunities, we suggest that the County identify sources and amounts of matching funding to determine the respective capacity to secure grant funding.

SYNOPSES REFERENCES

[8.1] Rural Development, U.S. Department of Agriculture (2022). Available at: https://www.rd.usda.gov/

[8.2] Rural Development, U.S. Department of Agriculture (2022). Community Connect Grants. Available at: https://www.rd.usda.gov/programs-services/telecommunications-programs/community-connect-grants

[8.3] Rural Development, U.S. Department of Agriculture (2022). Distance Learning & Telemedicine Grants. Available at: https://www.rd.usda.gov/programs-services/telecommunications-programs/distance-learning-telemedicine-grants

[8.4] U.S. Department of Agriculture (2022). ReConnect Loan and Grant Program. Available at: https://www.usda.gov/reconnect

[8.5] Rural Development, U.S. Department of Agriculture (2022). Rural Broadband Loans, Loan/Grant Combinations, and Loan Guarantees. Available at: https://www.rd.usda.gov/programs-services/telecommunications-programs/rural-broadband-loans-loangrant-combinations-and-loan-guarantees

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[8.7] Department of Commerce - National Telecommunications and Information Administration (NTIA) (2022) Available at: https://www.ntia.doc.gov/

[8.8] Department of Commerce - National Telecommunications and Information Administration (NTIA) (2022). Broadband Equity, Access and Deployment (BEAD) Program. Available at: https://www.internetforall.gov/program/broadband-equity-access-and-deployment-bead-program

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[8.10] U.S. Department of Housing and Urban Development (2022). Available at: https://www.hud.gov/

[8.11] U.S. Department of Housing and Urban Development (2022). CDBG Entitlement Program. Available at: https://www.hudexchange.info/programs/cdbg-entitlement/

[8.12] U.S. Department of Housing and Urban Development (2022). FY2022 Notice of Funding Availability (NOFA) Information. Available at: https://www.hud.gov/program_offices/public_indian_housing/programs/ph/cn/fy22funding

[8.13] U.S. Department of Housing and Urban Development (2022). FY2022 Notice of Funding Availability (NOFA) Information. Available at: https://www.hud.gov/program_offices/public_indian_housing/programs/ph/cn/fy22funding

[8.14] U.S. Department of Transportation (2022). Available at: https://www.transportation.gov/

[8.15] U.S. Department of Transportation (2022). RAISE Discretionary Grants. Available at: https://www.transportation.gov/RAISEgrants

[8.16] U.S. Department of Homeland Security (2022). Available at: https://www.fema.gov/

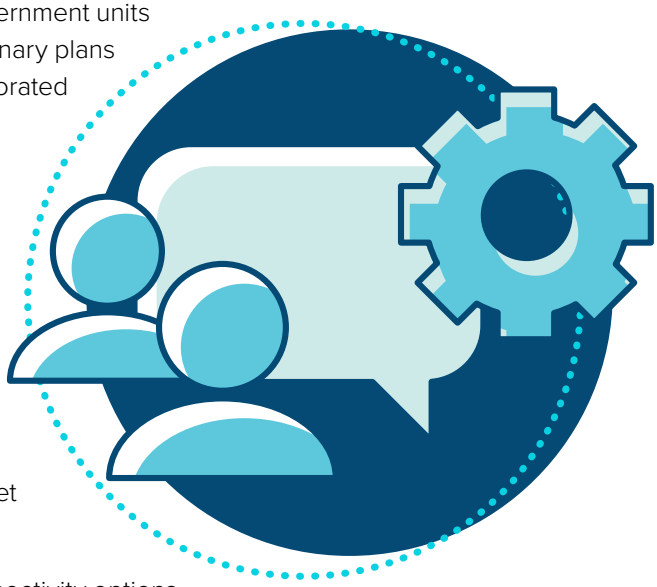
[8.17] U.S. Department of Homeland Security (2022). Building Resilient Infrastructure and Communities. Available at: https://www.fema.gov/grants/mitigation/building-resilient-infrastructure-communities

9 Recommendations and Next Steps

The recommendations and next steps were developed by the project team based on the findings from all the performed tasks. These recommendations are not exclusive of one another and many of them can and should happen in parallel to any engineering and construction activities.

1. Expand Stakeholder Group

a. Lit Communities recommends that the County put together a committee of community stakeholders from both the public and private sector to assess the findings of this report and take action.
   i. This committee should consist of various industries prominent across the County as well as representation from the various local government units (townships, villages and cities) impacted by the preliminary plans performed and whose anchor institutions were incorporated into the fiber network and wireless designs
   ii. Collaboration with other counties and municipalities within the region should be considered and an engagement and outreach plan developed by the committee to communicate the findings and possible next steps identified during this assessment.



2. Review and Prioritize Areas

Lit recommends prioritizing Rings 1, 2, 3 and 4 for a network build as these Rings contain the highest number of underserved and unserved residents as determined through the Market Service and Incumbent Analysis.

b. This strategic start allows the County to focus first on connectivity options for those most in need.
c. The County should review all data to understand the costs involved in creating a network that can be leveraged to bring connectivity to the prioritized areas.
d. Outreach and engagement with these townships and villages within these Rings, along with the anchor institutions that would be served, should begin once the County has finalized its strategy.

3. Create a Phased and Hybrid Approach to Enhancing Connectivity

a. Middle Mile Build and Wireless Network Plan
   i. In order to speed deployment and reduce costs, a Middle Mile Build and Wireless Network that includes existing provider infrastructure and new fiber should be considered. Existing provider net-

works within Defiance County give County leadership and the providers an opportunity to combine resources and increase fiber and wireless capacity.

1. To achieve this the County could conduct a detailed wireless assessment with propagation mapping to understand the optimal path and how existing and future plans for infrastructure can be integrated into a wireless network plan. This would entail working with local providers to use their network infrastructure maps for the detailed wireless design.

4. Continue to Refine Network Design

a. Perform an On Site Construction Ride Out and Make Ready Engineering Assessment:
   i. To continue to refine data on build-out costs, outside plant engineering experts should drive as well as visit sites along the selected path to inspect the pole lines and ground conditions.
   ii. All of the in-depth condition assessment and ratings completed during the Construction Ride Out and Make Ready Engineering Assessment can be taken and worked into the detailed design and refine the financial model.
   iii. These steps would also include working closely with Pole Owners to determine the most acceptable and cost-effective ways to access aerial routes. Some examples Lit recommends are One-Touch Make Ready, allowing the new fiber network to be the lowest attachment on the pole, partial ownership, reduced usage fees for the utility, and expedited approval timelines.

5. Find Partners to Assist with the Network Plan

a. Develop and institute a procurement strategy that will allow the County to solicit proposals from partners who would be interested in some or all of the following:
   i. Creating a public private partnership with the County.
   ii. Providing professional services that will assist the County in leveraging internal resources and building county owned fiber backhaul
   iii. Outlining the specific investment the provider is willing to make to any proposed network build.

6. Pursue Future Funding

a. With all the financial models completed, the data clearly shows a need for a creative and strategic capital stack to be developed in order to complete a phased fiber and wireless network buildout.
b. All funding sources should be evaluated in addition to looking at the creation of a consortium that will raise capital and reach all parts of the County. Private and philanthropic funding sources should be explored with local, regional and national partners. A public private partnership can fund additional work throughout other parts of the County and partners should be asked to outline their capital investment.
c. The County should be ready to request funding to build off of what will be accomplished using already received ARPA funds, including the pursuit of U.S. Treasury Capital Projects Funds, US Department of Agriculture's ReConnect Program and the forthcoming opportunities from the National Telecommunications and Information Administration (NTIA)- the Broadband Equity, Acces and Deployment Grant, funded through the recently enacted Infrastructure Investment and Jobs Act (IIJA).
d. Defiance County should leverage existing relationships with the Broadband Ohio Community Accelerator and the Ohio Broadband Expansion Authority to make sure that any proposal submitted syncs with the State of Ohio's Broadband planning efforts. Inclusion of the costs to reach underserved and unserved areas within Defiance County should be part of these proposals.
e. If a procurement process can be instituted and a partner selected before an application is submitted, this public private partnership can add weight to the application.

Appendix A

Market Service & Incumbent Analysis

Internet Service Provider Plans for RESIDENTIAL Customers

As Advertised on BroadbandNow

Zip Codes	Internet Service Provider	Coverage Percentage	Infrastructure Type	Max Download Speed (Mbps) (Up To)	Max Upload Speed (Mbps) (Up To)	Minimum Starting Price	Max Starting Price
43506	Spectrum	87.10%	Cable	1000	Not listed	$49.99	$89.99
	Frontier	85.80%	DSL	Not listed	Not listed	$49.99	Not listed
	Viasat	100.00%	Satellite	50	Not listed	$49.99	$149.99
	HughesNet	100.00%	Satellite	25	Not listed	$64.99	$159.99
	T-Mobile	27.00%	5G Internet	182	Not listed	$50.00	Not listed
	MetaLINK	100.00%	Fixed Wireless	50	Not listed	Not Listed	Not listed
	SAA Bright.net	64.60%	Fixed Wireless	100	20	$99.95	$109.95
	Bryan Municipal Utilities	60.30%	Cable	30	1.5	$31.00	$45.00
45821	Windstream	87.70%	Fiber	1000	Not listed	$39.99	$89.99
	T-Mobile	31.20%	5G Internet	182	Not listed	$50.00	Not listed
	Viasat	100.00%	Satellite	50	Not listed	$49.99	$149.99
	HughesNet	100.00%	Satellite	25	Not listed	$64.99	$159.99
	Spectrum	22.60%	Cable	1000	Not listed	$49.99	$89.99
	MetaLINK	100.00%	Fixed Wireless	50	Not listed	Not listed	Not listed
	SAA Bright.net	100.00%	Fixed Wireless	100	20	$99.95	$109.95
	SMTA	16.90%	Fiber	1000	500	$160.00	$200.00
	Arthur Mutual Telephone	12.50%	Fiber	1000	920	$99.95	$170
45831	T-Mobile	65.30%	5G Internet	182	Not listed	$50.00	Not listed
	Viasat	100.00%	Satellite	50	Not listed	$49.99	$149.99
	HughesNet	100.00%	Satellite	25	Not listed	$64.99	$159.99
	MetaLINK	100.00%	Fixed Wireless	50	Not listed	Not listed	Not listed
	Bright.Net North	99.40%	Fixed Wireless	25	Not listed	Not listed	Not listed
	TDS	86.80%	DSL	100	Not listed	$24.95	Not listed
	WATCH	84.20%	Fixed Wireless	100	Not listed	$99.99	$120
	Consolidated	53.60%	Cable	100	Not listed	$49.95	Not listed
	Consolidated	53.60%	DSL	100	Not listed	$29.00	Not listed
	Benton Ridge Telephone Company	12.60%	DSL	2	Not listed	Not listed	Not listed
	Ottoville Mutual Telephone Company	5.50%	Fiber	500	500	$164.95	$195
	Arthur Mutual Telephone	3.70%	Fiber	1000	920	$99.95	$170

Zip Codes	Internet Service Provider	Coverage Percentage	Infrastructure Type	Max Download Speed (Mbps) (Up To)	Max Upload Speed (Mbps) (Up To)	Minimum Starting Price	Max Starting Price
43512	Spectrum	79.70%	Cable	1000	Not listed	$49.99	$90
	CenturyLink	74.50%	Fiber	940	Not listed	$50.00	$65
	T-Mobile	37.40%	5G Internet	182	Not listed	$50.00	Not listed
	Viasat	100.00%	Satellite	50	Not listed	$49.99	$149.99
	HughesNet	100.00%	Satellite	25	Not listed	$64.99	$159.99
	MetaLINK	100.00%	Fixed Wireless	50	Not listed	Not listed	Not listed
	Arthur Mutual Telephone	9.90%	Fiber	1000	920	$99.95	$170
	Ayersville Telephone Company	4.80%	DSL	35	1	$83.15	$107
	SMTA	3.00%	Fiber	1000	500	$160.00	$200.00
43517	Spectrum	58.40%	Cable	1000	Not listed	$49.99	$90
	T-Mobile	52.80%	5G Internet	182	Not listed	$50.00	Not listed
	Frontier	78.10%	DSL	Not listed	Not listed	$49.99	Not listed
	Viasat	100.00%	Satellite	50	Not listed	$49.99	$149.99
	HughesNet	100.00%	Satellite	25	Not listed	$64.99	$159.99
	MetaLINK	100.00%	Fixed Wireless	50	Not listed	Not listed	Not listed
	WATCH	91.10%	Fixed Wireless	100	Not listed	$99.99	$120
	Mercury Broadband	5.40%	Fixed Wireless	150	Not listed	$65.00	$99.00
43519	Spectrum	100.00%	Cable	1000	Not listed	$49.99	$90
	Frontier	100.00%	DSL	Not listed	Not listed	Not listed	Not listed
	Viasat	100.00%	Satellite	50	Not listed	$49.99	$149.99
	HughesNet	100.00%	Satellite	25	Not listed	$64.99	$159.99
	MetaLINK	100.00%	Fixed Wireless	50	Not listed	Not listed	Not listed
	SAA Bright.net	64.10%	Fixed Wireless	100	20	$99.95	$109.95
43520	No data available	No data available	No data available	No data available	No data available	No data available	No data available
43526	T-Mobile	57.00%	5G Internet	182	Not listed	$50.00	Not listed
	Frontier	80.30%	DSL	Not listed	Not listed	$49.99	Not listed
	Viasat	100.00%	Satellite	50	Not listed	$49.99	$149.99
	HughesNet	100.00%	Satellite	25	Not listed	$64.99	$159.99
	MetaLINK	100.00%	Fixed Wireless	50	Not listed	Not listed	Not listed
	Mediacom	64.40%	Cable	1000	Not listed	$39.99	$60
	SMTA	61.30%	Fiber	1000	500	$160.00	$200.00
	WATCH	45.60%	Fixed Wireless	100	Not listed	$99.99	$120
	SAA Bright.net	44.90%	Fixed Wireless	100	20	$99.95	$109.95
	Mercury Broadband	8.10%	Fixed Wireless	150	Not listed	$65.00	$99.00

Zip Codes	Internet Service Provider	Coverage Percentage	Infrastructure Type	Max Download Speed (Mbps) (Up To)	Max Upload Speed (Mbps) (Up To)	Minimum Starting Price	Max Starting Price
43527	CenturyLink	72.30%	DSL	100	Not listed	$50.00	$65
	Spectrum	55.90%	Cable	1000	Not listed	$49.99	$90
	Viasat	100.00%	Satellite	50	Not listed	$49.99	$149.99
	HughesNet	100.00%	Satellite	25	Not listed	$64.99	$159.99
	MetaLINK	100.00%	Fixed Wireless	50	Not listed	Not listed	Not listed
	Bright.Net North	93.90%	Fixed Wireless	25	Not listed	Not listed	Not listed
	WATCH	83.60%	Fixed Wireless	100	Not listed	$99.99	$120
	Ayersville Telephone Company	3.20%	DSL	35	1	$83.15	$107
	Consolidated	2.60%	DSL	100	Not listed	$29.00	Not listed
	Consolidated	2.60%	Cable	100	Not listed	$49.95	Not listed
43530	No data available	No data available	No data available	No data available	No data available	No data available	No data available
43536	Viasat	100.00%	Satellite	50	Not listed	$49.99	$149.99
	HughesNet	100.00%	Satellite	25	Not listed	$64.99	$159.99
	Windstream	11.20%	DSL	200	Not listed	$39.99	$89.99
	MetaLINK	100.00%	Fixed Wireless	50	Not listed	Not listed	Not listed
	SAA Bright.net	100.00%	Fixed Wireless	100	20	$99.95	$109.95
	SMTA	40.40%	Fiber	1000	500	$160.00	$200.00
43545	CenturyLink	84.40%	DSL	100	Not listed	$50.00	$65
	Spectrum	75.10%	Cable	1,000	Not listed	$49.99	$90
	T-Mobile	41.20%	5G Internet	182	Not listed	$50.00	Not listed
	Viasat	100.00%	Satellite	50	Not listed	$49.99	$149.99
	HughesNet	100.00%	Satellite	25	Not listed	$64.99	$159.99
	MetaLINK	100.00%	Fixed Wireless	50	Not listed	Not listed	Not listed
	Bright.Net North	89.30%	Fiber	100	Not listed	Not listed	Not listed
	FMTC	7.90%	Fiber	100	Not listed	Not listed	Not listed
	RTECT	4.00%	Fiber	1000	200	$84.95	$119.95
	M2X Communications	2.70%	Fiber	500	20	$89.95	$149.95
	Ridgevilled Telephone Company	1.40%	DSL	50	10	$49.95	$60
43548	Viasat	100.00%	Satellite	50	Not listed	$49.99	$149.99
	HughesNet	100.00%	Satellite	25	Not listed	$64.99	$159.99
	MetaLINK	100.00%	Fixed Wireless	50	Not listed	Not listed	Not listed
	WATCH	98.90%	Fixed Wireless	100	Not listed	$99.99	$120
	Bright.Net North	93.30%	Fixed Wireless	25	Not listed	Not listed	Not listed
	Consolidated	20.60%	DSL	100	Not listed	$29.00	Not listed
	Consolidated	20.60%	Cable	100	Not listed	$49.95	Not listed
	Ayersville Telephone Company	4.10%	DSL	35	1	$83.15	$107

Zip Codes	Internet Service Provider	Coverage Percentage	Infrastructure Type	Max Download Speed (Mbps) (Up To)	Max Upload Speed (Mbps) (Up To)	Minimum Starting Price	Max Starting Price
43549	Spectrum	59.90%	Cable	1000	Not listed	$49.99	$90
	Frontier	86.00%	DSL	Not listed	Not listed	$49.99	Not listed
	Viasat	100.00%	Satellite	50	Not listed	$49.99	$149.99
	HughesNet	100.00%	Satellite	25	Not listed	$64.99	$159.99
	MetaLINK	100.00%	Fixed Wireless	50	Not listed	Not listed	Not listed
	SAA Bright.net	89.90%	Fixed Wireless	100	20	$99.95	$109.95
	SMTA	6.20%	Fiber	1000	500	$160.00	$200.00
43556	Viasat	100.00%	Satellite	50	Not listed	$49.99	$149.99
	HughesNet	100.00%	Satellite	25	Not listed	$64.99	$159.99
	Windstream	3.70%	DSL	200	Not listed	$39.99	$89.99
	Frontier	1.20%	DSL	Not listed	Not listed	Not listed	Not listed
	MetaLINK	100.00%	Fixed Wireless	50	Not listed	Not listed	Not listed
	SAA Bright.net	98.30%	Fixed Wireless	100	20	$99.95	$109.95
	SMTA	94.60%	Fiber	1,000	500	$160.00	$200.00
45813	T-Mobile	67.60%	5G Internet	182	Not listed	$50.00	Not listed
	Frontier	79.20%	DSL	Not listed	Not listed	$49.99	Not listed
	Viasat	100.00%	Satellite	50	Not listed	$49.99	$149.99
	HughesNet	100.00%	Satellite	25	Not listed	$64.99	$159.99
	Windstream	26.00%	DSL	200	Not listed	$39.99	$89.99
	MetaLINK	100.00%	Fixed Wireless	50	Not listed	Not listed	Not listed
	SAA Bright.net	81.30%	Fixed Wireless	100	20	$99.95	$109.95
	Mediacom	56.40%	Cable	1000	Not listed	$39.99	$60
	WATCH	19.40%	Fixed Wireless	100	Not listed	$99.99	$120

Internet Service Provider Plans for COMMERCIAL Customers

As Advertised on BroadbandNow

Zip Codes	Internet Service Provider	Coverage Percentage	Infrastructure Type	Max Download Speed (Mbps) (Up To)	Max Upload Speed (Mbps) (Up To)	Minimum Starting Price	Max Starting Price
43506	Spectrum	80.40%	Fiber	1000	Not listed	Not listed	Not listed
	Frontier	100.00%	DSL	Not listed	Not listed	Not listed	Not listed
	Bryan Municipal Utilities	25.40%	Fiber	30	1.5	Not listed	Not listed
	MetaLINK	100.00%	Fixed Wireless	50	Not listed	Not listed	Not listed
	US Signal Company	0.60%	Fiber	1000	Not listed	Not listed	Not listed
	Verizon	0.10%	Copper	Not listed	Not listed	Not listed	Not listed

Zip Codes	Internet Service Provider	Coverage Percentage	Infrastructure Type	Max Download Speed (Mbps) (Up To)	Max Upload Speed (Mbps) (Up To)	Minimum Starting Price	Max Starting Price
45821	Windstream	100.00%	Fiber	1000	Not listed	Not listed	Not listed
	Spectrum	53.70%	Cable	1,000	Not listed	Not listed	Not listed
	Agile Networks	100.00%	Fixed Wireless	25	5	$120.00	Not listed
	MetaLINK	100.00%	Fixed Wireless	50	Not listed	Not listed	Not listed
45831	Agile Networks	100.00%	Fixed Wireless	25	5	$120.00	Not listed
	MetaLINK	100.00%	Fixed Wireless	50	Not listed	Not listed	Not listed
	WATCH	100.00%	Fixed Wireless	100	Not listed	$99.99	120
	Consolidated	100.00%	DSL	20	Not listed	$29.00	Not listed
43512	Spectrum	84.30%	Fiber	1000	Not listed	$49.99	$90
	CenturyLink	100.00%	Fiber	940	Not listed	$50.00	Not listed
	Frontier	17.90%	DSL	Not listed	Not listed	Not listed	Not listed
	Agile Networks	100.00%	Fixed Wireless	25	5	$120.00	Not listed
	MetaLINK	100.00%	Fixed Wireless	50	Not listed	Not listed	Not listed
	Crown Castle	1.50%	Fiber	Not listed	Not listed	Not listed	Not listed
43517	Spectrum	28.60%	Fiber	1000	Not listed	$49.99	$90
	Frontier	100.00%	DSL	Not listed	Not listed	Not listed	Not listed
	Bryan Municipal Utilities	23.10%	Fiber	30	1.5	Not listed	Not listed
	MetaLINK	100.00%	Fixed Wireless	50	Not listed	Not listed	Not listed
	WATCH	100.00%	Fixed Wireless	100	Not listed	$99.99	$120
	Verizon	1.10%	Copper	Not listed	Not listed	Not listed	Not listed
43519	Spectrum	100.00%	Cable	1000	Not listed	$49.99	$90
	Frontier	80.60%	DSL	Not listed	Not listed	Not listed	Not listed
	MetaLINK	100.00%	Fixed Wireless	50	Not listed	Not listed	Not listed
43520	No data available	No data available	No data available	No data available	No data available	No data available	No data available
43526	Frontier	100.00%	DSL	Not listed	Not listed	Not listed	Not listed
	Mediacom	27.20%	Cable	1000	Not listed	$19.99	Not listed
	MetaLINK	100.00%	Fixed Wireless	50	Not listed	Not listed	Not listed
	WATCH	100%	Fixed Wireless	100	Not listed	$99.99	120
	Independents Fiber Network	23.30%	Fiber	Not listed	Not listed	Not listed	Not listed
43527	CenturyLink	100.00%	DSL	100	Not listed	$50.00	$65
	Spectrum	34.50%	Cable	1000	Not listed	$49.99	$90
	Agile Networks	100.00%	Fixed Wireless	25	5	$120.00	Not listed
	MetaLINK	100.00%	Fixed Wireless	50	Not listed	Not listed	Not listed
	WATCH	100.00%	Fixed Wireless	100	Not listed	$99.99	$120
	Consolidated	7.30%	DSL	15	Not listed	$29.00	Not listed

Zip Codes	Internet Service Provider	Coverage Percentage	Infrastructure Type	Max Download Speed (Mbps) (Up To)	Max Upload Speed (Mbps) (Up To)	Minimum Starting Price	Max Starting Price
43530	No data available	No data available	No data available	No data available	No data available	No data available	No data available
43536	Windstream	10.50%	DSL	100	Not listed	Not listed	Not listed
	MetaLINK	100.00%	Fixed Wireless	50	Not listed	Not listed	Not listed
43545	CenturyLink	100.00%	Fiber	940	Not listed	$50.00	Not listed
	Spectrum	53.30%	Fiber	1000	Not listed	$49.99	Not listed
	Agile Networks	77.50%	Fixed Wireless	25	5	$120.00	Not listed
	FMTC	15.90%	DSL	10	0.256	$35.95	Not listed
	M2X Communications	11.30%	Fiber	500	20	$89.95	$149.95
	MetaLINK	100.00%	Fixed Wireless	50	Not listed	Not listed	Not listed
	Verizon	0.10%	Copper	Not listed	Not listed	Not listed	Not listed
43548	Agile Networks	34.30%	Fixed Wireless	25	5	$120.00	Not listed
	MetaLINK	100.00%	Fixed Wireless	50	Not listed	Not listed	Not listed
	WATCH	100.00%	Fixed Wireless	100	Not listed	$99.99	$120
	Consolidated	100.00%	DSL	20	Not listed	$29.00	Not listed
43549	Spectrum	45.40%	Fiber	1,000	Not listed	$49.99	$90
	Frontier	100.00%	DSL	Not listed	Not listed	Not listed	Not listed
	Agile Networks	29.80%	Fixed Wireless	25	5	$120.00	Not listed
	MetaLINK	100.00%	Fixed Wireless	50	Not listed	Not listed	Not listed
43556	Frontier	3.60%	DSL	Not listed	Not listed	Not listed	Not listed
	Agile Networks	27.90%	Fixed Wireless	25	5	$120.00	Not listed
	MetaLINK	100.00%	Fixed Wireless	50	Not listed	Not listed	Not listed
45813	Frontier	100.00%	DSL	Not listed	Not listed	Not listed	Not listed
	Windstream	6.70%	DSL	100	Not listed	Not listed	Not listed
	Mediacom	13.50%	Cable	1000	Not listed	$19.99	Not listed
	Agile Networks	50.10%	Fixed Wireless	25	5	$120.00	Not listed
	MetaLINK	100.00%	Fixed Wireless	50	Not listed	Not listed	Not listed
	Independents Fiber Network	57.80%	Fiber	Not listed	Not listed	Not listed	Not listed
	WATCH	65.20%	Fixed Wireless	100	Not listed	$99.99	$120

Appendix B

Preliminary Middle Mile Design w/ Street ROWs Anchor Institutions

Name	Agency Type	Address	City	Zip	Latitude	Longitude	EPSG	First Responder	Path	Ring
Sherwood Library	Library				41.287	-84.553	4326	No	Redundant	1
Hicksville Library	Library				41.293	-84.763	4326	No	Redundant	1
Hicksville Exempted Village School	School				41.302	-84.746	4326	No	Redundant	1
Central Local Schools	School				41.350	-84.553	4326	No	Redundant	1
Doctor's Office in Sherwood	Healthcare Building				41.300	-84.554	4326	Yes	Redundant	1
Community Memorial Hospital	Hospital				41.301	-84.756	4326	Yes	Redundant	1
Farmer Fire Department	Fire Department	9985 St. Rt. 249	Farmer	43506	41.384	-84.632	4326	Yes	Redundant	1
Hicksville Police Department	Police Department	510 W. High St.	Hicksville	43526	41.288	-84.775	4326	Yes	Redundant	1
Sherwood Fire Department	Fire Department	101 Vine St	Sherwood	43556	41.287	-84.554	4326	Yes	Redundant	1
Hicksville Fire Department	Fire Department	117 S. Main St	Hicksville	43526	41.293	-84.761	4326	Yes	Redundant	1
Northeastern Local Schools	School				41.305	-84.388	4326	No	Redundant	2
Defiance County Highway Garage	County Building				41.335	-84.430	4326	No	Redundant	2
Promedica Defiance Hospital	Hospital				41.299	-84.377	4326	Yes	Redundant	2
Ohio State Highway Patrol	State Patrol	2350 Baltimore	Defiance	43512	41.276	-84.415	4326	Yes	Redundant	2
Defiance County EMA	Emergency Management	22491 Mill St.	Defiance	43512	41.309	-84.388	4326	Yes	Redundant	2
Defiance County EMA Building	County Building				41.309	-84.388	4326	Yes	Redundant	2
Defiance Memorial Airport	Airport				41.335	-84.428	4326	Yes	Redundant	2
Delaware Fire Department	Fire Department	10023 The Bend Rd	Defiance	43512	41.296	-84.515	4326	Yes	Redundant	2

Name	Agency Type	Address	City	Zip	Latitude	Longitude	EPSG	First Responder	Path	Ring
Noble Fire Department	Fire Department	22485 Mill St	Defiance	43512	41.309	-84.388	4326	Yes	Redundant	2
Ney Fire Department	Fire Department	125 E. Main St	Ney	43549	41.382	-84.523	4326	Yes	Redundant	2
Evergreen Lane Office Complex	Office Building				41.342	-84.417	4326	No	Redundant	3
Hospice Center	Healthcare Building				41.343	-84.360	4326	Yes	Redundant	3
Tiffin Township Fire Department	Fire Department	1116 Main St	Evansport	43519	41.426	-84.397	4326	Yes	Redundant	3
Independence Education Center	Education Building				41.341	-84.285	4326	No	Redundant	4
Everside Healthcare	Healthcare Building				41.311	-84.332	4326	Yes	Redundant	4
Jewell Fire Department	Fire Department	8125 Indepen-dence Rd	Defiance	43512	41.324	-84.285	4326	Yes	Redundant	4
Defiance College	College				41.297	-84.359	4326	No	Redundant	5
Defiance Library	Library				41.288	-84.358	4326	No	Redundant	5
Defiance County East	County Building				41.283	-84.342	4326	No	Redundant	5
Mercy Defiance Hospital	Hospital				41.284	-84.340	4326	Yes	Redundant	5
Defiance County Sheriff's Office	Sheriff's Office	113 Biede Ave	Defiance	43512	41.286	-84.343	4326	Yes	Redundant	5
South Richland Fire Department	Fire Department	1915 E Second St	Defiance	43512	41.282	-84.327	4326	Yes	Redundant	5
Defiance City Schools	School				41.264	-84.357	4326	No	Redundant	6
Ayersville Local Schools	School				41.238	-84.285	4326	No	Redundant	6
Courthouse Complex	County Building				41.287	-84.361	4326	No	Redundant	6
Defiance City Offices	City Building				41.283	-84.366	4326	No	Redundant	6
Highland Township Fire Department	Fire Department	27723 Watson Rd	Defiance	43512	41.239	-84.291	4326	Yes	Redundant	6
Defiance Fire Department	Fire Department	702 W. Third St.	Defiance	43512	41.287	-84.364	4326	Yes	Redundant	6
Defiance Police Department	Police Department	324 Perry St.	Defiance	43512	41.287	-84.364	4326	Yes	Redundant	6

Appendix

Financial Model Middle Mile w/ Street ROWS

https://www.defiance-county.com/Commissioners%20News%20Releases%20for%20internet/Public%20Notices.htm

Financial Model Last Mile w/ Street ROWS

https://www.defiance-county.com/Commissioners%20News%20Releases%20for%20internet/Public%20Notices.htm

Appendix D

Broadband Grant Development

Section I. Federal and State Broadband Grant Program Research

Federal Broadband Grant Program Eligibility

Federal Agency	Grant Program	Eligibility Status	Notes
Appalachian Regional Commission (ARC)	Area Development & Distressed Counties Programs	No	Not located in ARC footprint
	Central Appalachia & North Central/North Appalachia Broadband	No	Not located in ARC footprint
	Partnerships for Opportunity and Workforce and Economic Revitalization (POWER) Program	No	Not located in ARC footprint
Delta Regional Authority (DRA)	States Economic Development Assistance Program & Community Infrastructure Fund Program	No	Not located in DRA footprint
Department of Agriculture - Rural Development (USDA-RD)	Community Connect Grant Program	Yes (County Wide)	Rural and must have 90 to 100% unserved at 10 Mbps / 1 Mbps
	Distance Learning and Telemedicine Grants	Yes (County Wide)	Rural and must have 90 to 100% unserved at 10 Mbps / 1 Mbps
	ReConnect Program	Yes (County Wide)	Rural and must have 90 to 100% unserved at 100 Mbps / 20 Mbps
	Rural Broadband Access Loans and Loan Guarantees	Yes (County Wide)	Rural and must have 90 to 100% unserved at 10 Mbps / 1 Mbps
	Rural Economic Development Loan and Grant (REDLG) Program	No	Not an eligible applicant
	Rural Housing Service (RHS) Community Facilities (CF) Direct Loan and Grant Program	No	Not an eligible applicant
	Telecommunication Infrastructure Loans and Loan Guarantees	Yes (Select Areas)	Population cap is 5,000
Department of Commerce - Economic Development Administration (EDA)	FY 2022 Public Works and Economic Adjustment Assistance Program	No	County is not eligible based on Per Capita Income and Unemployment Rate requirements.
Department of Commerce - National Telecommunications and Information Administration (NTIA)	Broadband Equity, Access, and Deployment (BEAD) Program	Yes	County is an eligible applicant
	Enabling Middle Mile Broadband Infrastructure Program	Yes	County is an eligible applicant
	Tribal Broadband Connectivity Program	No	Not a Tribal Entity

Federal Agency	Grant Program	Eligibility Status	Notes
Department of Education (DOEd)	Alaska Native and Native Hawaiian-Serving Institutions Program	No	Not an eligible applicant
	American Indian Tribally Controlled Colleges and Universities Program	No	Not an eligible applicant
	Asian American and Native American Pacific Islander-Servicing Institutions Program	No	Not an eligible applicant
	Governor's Emergency Education Relief Fund (GEER)	Yes (Secondary)	Local education agencies who recieve funding from the State of OH can utilize program for broadband infrastructure deployment
	Elementary and Secondary School Emergency Relief Fund (ESSER)	Yes (Secondary)	Local education agencies who recieve funding from the Department of Education can utilize program for broadband infrastructure deployment
	Higher Education Emergency Relief Fund	Yes (Secondary)	Eligible IHEs can apply for assistance to support educational technology needs
	Impact Aid Programs	Yes (Secondary)	Eligible local education agencies can apply for assistance to support educational technology needs
	Native American-Serving Non-Tribal Institutions Program	No	Not an eligible applicant
	Promise Neighborhoods Program	Yes (Secondary)	Eligible local education agencies can apply for assistance to support educational technology needs
	Rural, Low-Income School (RLIS) Program	Yes (Secondary)	Eligible local education agencies can apply for assistance to support educational technology needs
	Small, Rural School Achievement (SRSA) Program	Yes (Secondary)	Eligible local education agencies can apply for assistance to support educational technology needs
	Title I, Part A. Improving Basic Programs Operated by Local Education Agencies Program	Yes (Secondary)	Eligible local education agencies can apply for assistance to support educational technology needs
	Title III, Part A. Strengthening Institutions Program	Yes (Secondary)	Eligible IHEs can apply for assistance to support educational technology needs
	Title III, Part B. Strengthening Historically Black Colleges and Universities Program	No	No HBCU's in the County
	Title IV, Part A. Student Support and Academic Enrichment Program	Yes (Secondary)	State education agencies can apply for funding to support the use of technology in order to improve the academic achievement and digital literacy for all students.
Department of Housing and Urban Development (HUD)	Community Development Block Grant (CDBG)	Yes	Defance County (Non-Entitlement) can apply for competitive funding and utilize the CDBG program for broadband connectivity efforts in Low to Moderate Income areas
	Choice Neighborhoods - Planning	Yes	In Low to Moderate Income eligible areas in Defiance County
	Choice Neighborhoods - Implementation	Yes	In Low to Moderate Income eligible areas in Defiance County
	Indian Community Development Block Grant	No	Not an eligible applicant
	Indian Housing Block Grant	No	Not an eligible applicant
	Title VI Loan Guarantee (IHBG)	No	Not an eligible applicant

Federal Agency	Grant Program	Eligibility Status	Notes
Department of Labor - Employment and Training Administration (ETA)	Workforce Development in Telecommunications Sector: Apprenticeship Investments in Support of Broadband and 5G	Yes (Secondary)	In partnership with an eligible community college
Department of Transportation	Rebuilding American Infrastructure With Sustainability and Equity (RAISE) Grant Program	Yes	Innovative technologies are eligible funding activities as part of a transportation infrastructure project
Department of Treasury	Community Reinvestment Act (CRA) Program	Yes (Secondary)	In partnership with a CDE in eligible areas designated by the U.S. Treasury in predominant Low to Moderate Income areas
Federal Communications Commission (FCC) - Universal Service Administrative Co.	E-Rate (Schools and Libraries) Program	Yes (Secondary)	Local education agencies can apply for subsidies to reduce internet connectivity and devices for students on campus only.
	5G Fund for Rural America	Yes (Secondary)	ISPs can apply to the FCC and USAC for subsidies in certain eligible areas
	Rural Health Care Program	Yes (Secondary)	Rural public health authorities can apply to the FCC and USAC for subsidies to enhance connectivity to support telehealth in select census tracts.
Department of Homeland Security - Federal Emergency Management Agency	Building Resilient Infrastructure and Communities	Yes	Project must be tied to resiliency, support enhanced connectivity for emergency responders and be included in a FEMA approved Hazard Mitigation Action Plan.
Office of Library Services - Institute of Museum and Library Services (IMLS)	Native American Library Services: Basic Grants	No	Not an eligible applicant
	Native American Library Services: Enhancement Grants	No	Not an eligible applicant
National Science Foundation (NSF)	Campus Cyberinfrastructure (CC*) Program	Yes (Secondary)	In partnership with an IHE
	Smart and Connected Communities (S&CC) Program	Yes (Secondary)	In partnership with an IHE
	Spectrum and Wireless Innovation Enabled by Future Technologies (SWIFT) Program	Yes (Secondary)	In partnership with an IHE
Northern Border Regional Commission	Economic and Infrastructure Development (EID) Program	No	Not located in the NBRC footprint

Federal Broadband Grant Program Matrix (Primary)

Federal Agency	Grant Program	Max. Grant	Program Capacity	Funding Type	Eligible Project Activities	Eligible Entities	Match Required
Department of Agriculture - Rural Development (USDA-RD)	Community Connect Grant Program	$3,000,000	$35,000,000	Grants	Infrastructure Development, Adoption & Digital Literacy and Public Computer Access	State and Local Government, Tribal Entities, Non-Profits, Private Corporations, LLCs	15%
	Distance Learning and Telemedicine Grants	$1,000,000	$60,000,000	Grants	Infrastructure Development, Adoption & Digital Literacy and Distance Learning & Telemedicine Equipment	State and Local Government, Tribal Entities, Non-Profits, Private Corporations, LLCs	15%
	ReConnect Program	$25,000,000 (Grant) / $50,000,000 (Loan)	$565,000,000	Grants, Combination Grant/Loan and Loans Only	Infrastructure Development, Acqusition of Facilities, Equipment and Professional Services	State and Local Government, Tribal Entities, Non-Profits, Private Corporations, LLCs	25%
	Rural Broadband Access Loans and Loan Guarantees	N/A	$11,200,000	Loan and Loan Guarantees	Infrastructure Development	State and Local Government, Tribal Entities, Private Corporations, LLCs	N/A
	Telecommunication Infrastructure Loans and Loan Guarantees	N/A	$690,000,000	Loan and Loan Guarantees	Infrastructure Development	State and Local Government, Tribal Entities, Private Corporations, LLCs	N/A
Department of Commerce - National Telecommunications and Information Administration (NTIA)	Broadband Equity, Access, and Deployment (BEAD) Program	Not Specified	$42,450,000,000	Grants	Planning & Broadband Infrastructure	States (Formula Allocation), Subgrantees: Local Government, Utility Company, Non-Profits, Co-Ops, For-Profits, Regional Planning Commissions	25%
	Enabling Middle Mile Broadband Infrastructure Program	Not Specified	$1,000,000,000 (over 5 years)	Grants	Middle Mile Broadband Infrastructure	States (Formula Allocation), Subgrantees: Local Government, Utility Company, Non-Profits, Co-Ops, For-Profits, Regional Planning Commissions	30%
Department of Housing and Urban Development (HUD)	Community Development Block Grant (CDBG)	Amounts Vary (Typical Award is <$500,000)	$3,475,000,000	Grants & Loan Guarantees (Sec. 108)	Infrastructure Development, Adoption & Digital Literacy, Planning and Public Computer Access	Local Government	0% (Entitlement Communities)
	Choice Neighborhoods - Planning	$450,000	$10,000,000	Grants	Planning	Local Government	0%
	Choice Neighborhoods - Implementation	$35,000,000	$195,000,000	Grants	Infrastructure Development, Adoption & Digital Literacy	Local Government	5%

Federal Agency	Grant Program	Max. Grant	Program Capacity	Funding Type	Eligible Project Activities	Eligible Entities	Match Required
Department of Transportation	Rebuilding American Infrastructure With Sustainability and Equity (RAISE) Grant Program	$1,000,000 (Rural) $5,000,000 (Urban)	$1,500,000,000	Grants	Planning, Capital Projects (Surface transportation projects), Innovative Technologies	State and Local Government, Transit Agencies, Port Authorities, and MPOs	20%
Department of Homeland Security - Federal Emergency Management Agency	Building Resilient Infrastructure and Communities	$600,000 (State) $50,000,000 (Competitive)	$500,000,000	Grants	Infrastructure Development and Planning	State and Local Government	25%

Federal Broadband Grant Program Synopses

United States Department of Agriculture - Rural Development

Community Connect Grant Program

CFDA Number: 10.863

Application Deadline: Fall 2022 (Anticipated)

Overview: The Community Connect Grant Program is authorized by the Consolidated Appropriations Acts of 2004 (P.L. 108-199), 2017 (P.L. 115-31) and 2018 (P.L. 115-141) to finance broadband transmission infrastructure in rural areas.

Purpose: The purpose of this grant program is to provide funding for broadband service in rural, economically-challenged communities where service does not currently exist.

Description: The program funds the following eligible project categories:

- Infrastructure Development
- Adoption and Digital Literacy and
- Public Computer Access

Eligible Project Activities:

- Construction, acquisition or leasing of facilities, including spectrum, land, towers or building used to deploy service to all residential and business customers in the proposed service area,
- Improvement, expansion, construction or acquisition of a Community Center to provide free access to broadband for public access 7 days a week. Grant funds provided for the Community Center cannot exceed the lesser of 10% of the total grant amount requested or $150,000,
- Funding for at least two but no more than ten Computer Access Points to be used in the Community Center and
- Cost of providing the necessary bandwidth to provide service free of charge to the Critical Community Facilities for two years.

Eligible Applicants: Eligible applicants include:

- Incorporated organization,
- Indian Tribe or Tribal Organization, as defined in 25 U.S.C. 450b(e),
- State or Local unit of Government
- Cooperative, private corporation or limited liability company organized on a for-profit or non-profit basis.

In addition to eligibility requirements listed above, applicants must also meet the following eligibility requirements:

- A project must also be located in rural areas with a population of 20,000 or less (map),
- Serve a Proposed Funded Service Area where broadband services (10 Mbps / 1 Mbps) do not currently exist (map),
- The applicant must agree to offer service at 25 Mbps / 3 Mbps to all residential and business customers within the service area,
- Provide broadband service at no charge for at least two years for each Critical Community Facility located within the service area,
- Provide a Community Center in the service area with at least two Computer Access Points and wireless access at 25 Mbps / 3 Mbps at no charge for at least two years and
- Not overlap with the service areas of current USDA Rural Utilities Service borrowers and grantees.

Total Funding Available (Based on FY 2022 Appropriations):

- $35 Million

Award Floor: $100,000

Award Ceiling: $3,000,000

Grant Match: Grant recipients are required to provide matching contributions in cash or in-kind equal to 15% of the grant amount requested.

Period of Performance: Not specified

Special Requirements: The program requires Grant recipients to comply with various federal statutes and regulations including,

- NEPA Environmental Requirements,
- Flood Hazard Area Precautions,
- Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970,

- Americans with Disabilities Act and
- Non-Duplication of Services

Program Point of Contact(s): A listing of USDA – RD State Offices can be found here.

Distance Learning and Telemedicine Grant Program

CFDA Number: 10.855

Application Deadline: Fall 2022 (Anticipated)

Overview: Since 1994, the Distance Learning and Telemedicine (DLT) Grant program has helped to establish hundreds of distance learning and telemedicine systems improving the quality of life for thousands of residents in rural communities across the United States.

Purpose: The purpose of this grant program is to assist rural communities in acquiring distance learning and telemedicine technologies to provide the link between local teachers and medical service providers who serve rural residents and other professionals located at distances too far to access otherwise.

Description: The program funds the following eligible project categories:

- Acquiring, by lease or purchase, eligible equipment,
- Acquiring instructional programming, and
- Providing technical assistance and instruction for using eligible equipment.

Eligible Project Activities:

- Computer hardware and software
- Site licenses and maintenance contracts
- Extended warranties (up to 3 years)
- Audio and video equipment
- Computer network components
- Telecommunications terminal equipment
- Data terminal equipment
- Interactive audio/visual equipment
- Inside wiring
- Broadband facilities, if owned by the applicant (20% of project budget limit)
- Instructional programming that is a capital asset, including the purchase or lease of instructional programming already on the market,
- Related software,
- Providing engineering and environmental studies relating to the establishment or expansion of the phase of the project to be financed with the grant (not to exceed 10% of the grant amount requested)

Eligible Applicants: Eligible applicants include:

- An Indian Tribe or Tribal Organization
- State or Local unit of Government
- Consortium
- Other legal entity, including a private corporation organized on a for-profit or non-profit basis

A project must also be located in rural areas with a population of 20,000 or less (map).

Total Funding Available (Based on FY 2022 Appropriations):

- $60 Million

Award Floor: $50,000

Award Ceiling: $1,000,000

Grant Match: Grant recipients are required to provide matching contributions in cash or in-kind equal to 15% of the grant amount requested.

Period of Performance: Not specified

Special Requirements: The program requires Grant recipients to comply with various federal statutes and regulations including,

- NEPA Environmental Requirements,
- Flood Hazard Area Precautions,
- Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970,
- Americans with Disabilities Act and
- Non-Duplication of Services

Program Point of Contact(s): A listing of USDA – RD State offices can be found here.

ReConnect Program

CFDA Number: 10.752

Application Deadline: November 2, 2022

Overview: The ReConnect Grant Program is authorized by the Consolidated Appropriations Acts of 2018 (P.L. 115-141) and the Rural Electrification Act of 1936, 7 U.S.C. 901 et seq. to finance broadband transmission infrastructure in rural areas.

Purpose: The purpose of this grant program is to expand broadband service in rural areas without sufficient access to broadband, defined as 100 megabits per second (Mbps) downstream and 20 Mbps upstream.

Description: The ReConnect Program furnishes loans and grants to provide funds for the costs of construction, improvement, or acquisition of facilities and equipment needed to provide broadband service in eligible rural areas.

Eligible Project Activities:

- Construction, acquisition or leasing of facilities, including spectrum, land, towers or building used to deploy service to all residential and business customers in the proposed service area,
- Pre-application expenses (up to 5% of the award amount),
- Acquisition and improvement of an existing system that is currently providing insufficient broadband service (100% Loan option only) and

- Terrestrial based facilities that support the provision of satellite broadband service.

Eligible Applicants: Eligible applicants include:

- Cooperatives, non-profits or mutual associations,
- For-profit corporations or limited liability companies,
- States, local governments or any agency, subdivision, or political subdivision thereof,
- A territory or possession of the U.S. and
- An Indian Tribe or Tribal Organization, as defined in 25 U.S.C. 450b.

In addition to eligibility requirements listed above, applicants must also meet the following eligibility requirements:

- A project must also be located in rural areas with a population of 20,000 or less (map),
- Serve a Proposed Funded Service Area where broadband services (100 Mbps / 20 Mbps) do not currently exist (map):
- 90% of the service area (50% Grant / 50% Loan Option and 100% Loan Option)
- 100% of the service area (100% Grant Option)
- The applicant must agree to offer service at a minimum of 25 Mbps / 3 Mbps to all residential and business customers within the service area and
- Not overlap with the service areas of current USDA Rural Utilities Service borrowers and grantees.

Total Funding Available (Based on FY 2022 Appropriations and IIJA Funding):

- $1.15 Billion

Award Floor: $100,000

Award Ceiling: $25 Million (100% Grant Option); $50 Million (50% Grant / 50% Loan Option); $50 Million (100% Loan Option)

Grant Match: Recipients of the 100% Grant Option are required to provide matching contributions in cash or in-kind equal to 25% of the grant amount requested.

Period of Performance: 60 Months

Special Requirements: The program requires Grant recipients to comply with various federal statutes and regulations including,

- NEPA Environmental Requirements,
- Flood Hazard Area Precautions,
- Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970,
- Americans with Disabilities Act and
- Non-Duplication of Services

Program Point of Contact(s): A listing of USDA – RD State offices can be found here.

Rural Broadband Access Loans and Loan Guarantees

CFDA Number: 10.886

Application Deadline: Applications are accepted on a rolling basis through September 30, 2022.

Overview: The Rural Broadband Access Loan and Loan Guarantee Program is authorized by the Rural Electrification Act (7 U.S.C. 901 et seq.), as amended by the Agricultural Act of 2014 (Pub. L. 113– 79), also referred to as the 2014 Farm Bill. The program was also reauthorized in the 2018 Farm Bill, through fiscal year 2023.

Purpose: The purpose of this grant program is to provide funding for projects that offer broadband service at or beyond specific broadband lending speeds, which are determined by the RUS in the respective publication in the Federal Register. RUS established the minimum rate-of-data transmission of 25 megabits downstream and 3 megabits upstream for both mobile and fixed service.

Description: The program funds the following eligible loan types:

- Cost-of-Money Loans in the form of direct loans from the USDA Rural Utilities Service,
- Direct 4-Percent Loans which bear interest at 4 percent on each advance made to the borrower and
- Other Loan Guarantees provided by third party lenders, of which the RUS will guarantee up to 80 percent of the principal amount of the loan.

Eligible Project Activities:

- Construction, improvement and acquisition of all facilities required to provide service at the minimum speed established by the USDA,
- Cost of leasing facilities required to provide service if the lease qualifies as a capital lease under Generally Acceptable Accounting Procedures (GAAP),
- Acquisition of facilities, portions of an existing system and/or another company (up to 50% of the requested loan amount),
- Refinancing of an outstanding obligation from another telecommunications loan made by the USDA (up to 40% of the requested amount) and
- Pre-loan expenses including market surveys, consultant costs and fees (up to 5% of the requested amount).

Eligible Applicants: Eligible applicants include:

- Corporation,
- Limited Liability Company,
- Cooperative or mutual organization,
- Indian Tribe or Tribal Organization, as defined in 25 U.S.C. 450b and
- State or Local unit of Government.

In addition to eligibility requirements listed above, applicants must also meet the following eligibility requirements:

- A project must also be located in rural areas with a population of 20,000 or less (map),
- At least 15% of the households in the Proposed Funded Service Area do not have access to broadband service (map),
- No part of the Proposed Funded Service Area has three or more incumbent service providers and
- Non-duplicative of other borrowers or service areas funded by the RUS Telecommunications Program.

Total Funding Available (Based on FY 2022 Appropriations):

- $11.2 Million

Award Floor: $100,000

Award Ceiling: $25,000,000

Grant Match: As a condition to financing, an applicant must demonstrate an equity contribution in an amount that is at least 10% of the requested loan amount at the time of application

submission.

Period of Performance: Loan terms are based upon the USDA's determination of the project's useful life plus three years.

Special Requirements: The program requires Grant recipients to comply with various federal statutes and regulations including,

- NEPA Environmental Requirements,
- Flood Hazard Area Precautions,
- Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970,
- Americans with Disabilities Act and
- Non-Duplication of Services

Program Point of Contact(s): A listing of USDA – RD State offices can be found here.

Telecommunication Infrastructure Loans and Loan Guarantees

CFDA Number: 10.851

Application Deadline: Applications are accepted on a rolling basis through September 30, 2022.

Overview: The Telecommunications Infrastructure Loan and Loan Guarantee Program is authorized by the Rural Electrification Act (7 U.S.C. 901 et seq.), Titles II and III, 7 U.S.C. 921, 922-924, and 930-940.

Purpose: The purpose of this grant program is to provide financing for the construction, maintenance, improvement and expansion of telephone service and broadband in rural areas.

Description: The program funds the following eligible loan types:

- Cost-of-Money Loans in the form of direct loans from the USDA Rural Utilities Service,
- Loan Guarantees through the Federal Financing Bank (FFB), and
- Hardship Loans in the form of direct loans from the USDA Rural Utilities Service.

Eligible Project Activities:

- Construction, improvement and acquisition of all facilities required to provide service at the minimum speed established by the USDA,
- Acquisition of facilities, portions of an existing system and/or another company (up to 50% of the requested loan amount), and
- Refinancing of an outstanding obligation from another telecommunications loan made by the USDA (up to 40% of the requested amount).

Eligible Applicants: Eligible applicants include:

- Corporation,
- Limited Liability Company,
- Cooperative or mutual organization,
- Indian Tribe or Tribal Organization, as defined in 25 U.S.C. 450b and
- State or Local unit of Government.

In addition to eligibility requirements listed above, applicants must also meet the following eligibility requirements:

- A project must also be located in rural areas with a population of 5,000 or less (map),
- Non-duplicative of other borrowers or service areas funded by the RUS Telecommunications Program.

Total Funding Available (Based on FY 2022 Appropriations): $690 Million

Award Floor: $50,000

Award Ceiling: No limit has been specified by the USDA for this program.

Grant Match: As a condition to financing, an applicant must demonstrate an equity contribution in an amount that is at least 10% of the requested loan amount at the time of application submission.

Period of Performance: Loan terms are based upon the USDA's determination of the project's useful life plus three years.

Special Requirements: The program requires Grant recipients to comply with various federal statutes and regulations including,

- NEPA Environmental Requirements,
- Flood Hazard Area Precautions,
- Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970,
- Americans with Disabilities Act and
- Non-Duplication of Services

Program Point of Contact(s): A listing of USDA – RD State offices can be found here.

Department of Commerce - National Telecommunications and Information Administration (NTIA)

Broadband Equity, Access, and Deployment Program (BEAD)

CFDA Number: 11.035

Application Deadline: July 18, 2022 (Letter of Intent), August 15,2022 (requests for Initial Planning Funds and supplemental information)

Overview: The Broadband Equity, Access, and Deployment (BEAD) Program (Program), authorized by the Infrastructure Investment and Jobs Act of 2021, Division F, Title I, Section 60102, Public Law 117-58, 135 Stat. 429 (November 15, 2021) (Infrastructure Act or Act) also known as the Bipartisan Infrastructure Law. The BEAD Program provides new federal funding for NTIA to grant to all fifty states, the District of Columbia, and Puerto Rico (States), as well as American Samoa, the Commonwealth of the Northern Mariana Islands, Guam, and the United States Virgin Islands (Territories), and in certain circumstances political subdivisions of these States and Territories, for broadband planning, deployment, mapping, equity, and adoption activities.

Purpose: The purpose of the BEAD is to provide federal funding to States and U.S. Territories to deploy broadband infrastructure to eligible service areas of the country. Funding is distributed primarily based on the relative number of "unserved" locations (i.e., broadband-serviceable locations that lack access to Reliable Broadband Service at speeds of at least 25 Mbps downstream and 3 Mbps upstream and latency levels low enough to support real time, interactive applications) in each State and Territory.

Description: The program funds the following eligible project activities:

- Planning (e.g., feasibility)
- Broadband Infrastructure (e.g., construction)

Eligible Project Activities:

- At this time, only the Planning Grant NOFO has been released by NTIA. NTIA is expected to issue further NOFOs with additional details for State-level eligibility and project activi-

ties based on their 5-Year Action Plans.

Eligible Applicants:

- States
- Washington, DC
- U.S. Territories
- The Commonwealth of the Northern Mariana Islands

Total Funding Available: $41,601,000,000

Award Floor: $100,000,000 (see special requirements)

Award Ceiling: Final State Allocations TBD

Grant Match: 25%, unless designated as a "high-cost area" as defined in Section 60102(a)(2)(G), and other cases in which NTIA has waived the matching requirement pursuant to Section 60102(h)(3)(A)(ii)).

Period of Performance: 60 months

Special Requirements: Each State is eligible to receive a minimum allocation of $100,000,000. Each State may request up to $5,000,000 of its minimum allocation in Initial Planning Funds. American Samoa, Guam, the U.S. Virgin Islands, and the Commonwealth of the Northern Mariana Islands each are eligible to receive a minimum allocation of $25,000,000. Each of those territories may request up to $1,250,000 of its minimum allocation in Initial Planning Funds. Not less than twenty percent of the total allocation for a State or Territory will be made available at the approval of the Initial Proposal with remaining funds released upon approval of the Final Proposal.

The program requires also grant recipients to comply with various federal statutes and regulations including:

- NEPA Environmental Requirements,
- Flood Hazard Area Precautions,
- Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970,
- Americans with Disabilities Act, and
- Appendix A. Certifications Regarding Federal Felony and Federal Criminal Tax Convictions, Unpaid Federal Tax Assessments and Delinquent Federal Tax Returns.

Program Point of Contact(s): The Office of Internet Activity and Growth can be contacted by E-mail here.

Middle Mile Grant Program

CFDA Number: 11.033

Application Deadline: September 30, 2022

Overview: The National Telecommunications and Information Administration (NTIA) issues this Notice of Funding Opportunity (NOFO) to describe the requirements under which it will award grants for the Middle Mile Grant (MMG) Program, authorized by the Infrastructure Investment and Jobs Act of 2021, Division F, Title IV, Section 60401, Public Law 117-58, 135 Stat. 429 (November 15, 2021) (Infrastructure Act or Act), also known as the Bipartisan Infrastructure Law. The MMG Program provides funding for the construction, improvement, or acquisition of middle mile infrastructure.

Purpose: The Middle Mile Broadband Infrastructure Grant (MMG) Program provides funding for the construction, improvement, or acquisition of middle mile infrastructure. The purpose of the grant program is to expand and extend middle mile infrastructure to reduce the cost of connecting areas that are unserved or underserved to the internet backbone.

Description: The program funds the following activities:

- Deployment of Middle Mile infrastructure, including the following types:
  - Any broadband infrastructure that does not connect directly to the end-user location, including an anchor institution; and
  - 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
  - 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.

Eligible Project Activities:

- Examples of eligible uses of funds include:
  - construction, improvement, and/or acquisition of facilities and telecommunications equipment,
  - engineering design, permitting and work related to environmental, historical and cultural reviews,
  - personnel costs, including salaries and fringe benefits for staff and consultants (e.g., project managers, subject matter experts, financial analysts, accountants, attorneys),
  - select pre-application expenses <$50,000 incurred after NOFO publication and before to grant award, and other costs necessary to programmatic activities, excluding ineligible costs.

Eligible Applicants: To apply for the MMG Program, an entity must be a State, political subdivision of a State, Tribal government, technology company, electric utility, utility cooperative, public utility district, telecommunications company, telecommunications cooperative, nonprofit foundation, nonprofit corporation, nonprofit institution, nonprofit association, regional planning council, Native entity, economic development authority, or any partnership of two (2) or more of these entities.

Total Funding Available: $980,000,000

Award Floor: $5,000,000 (see special requirements)

Award Ceiling: $100,000,000 (see special requirements)

Grant Match: The amount of a middle mile grant awarded to an eligible entity through this program may not exceed 70 percent of the total project cost.

Period of Performance: 60 Months from date of award, with a potential 12 month extension if the applicant certifies that:

- The eligible entity has a plan for use of the grant funds;
- The project to build out middle mile infrastructure is underway; or
- Extenuating circumstances require an extension of time to allow completion of the project to build out middle mile infrastructure.

Requests for extensions will be granted at the sole discretion of the Assistant Secretary.

Special Requirements: The period of performance for grants issued pursuant to this program ends five years from the date on which the grant funds are made available to the eligible entity.

The program requires also grant recipients to comply with various federal statutes and regulations including:

- NEPA Environmental Requirements,
- Flood Hazard Area Precautions,
- Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970,

- Americans with Disabilities Act, and
- Appendix A. Certifications Regarding Federal Felony and Federal Criminal Tax Convictions, Unpaid Federal Tax Assessments and Delinquent Federal Tax Returns.

Program Point of Contact(s): The Office of Internet Activity and Growth can be contacted by E-mail here.

United States Department of Housing and Urban Development

Community Development Block Grant (CDBG) – Non-Entitlement Communities

CFDA Number: 14.218

Application Deadline: Fall 2022 (Anticipated)

Overview: The Community Development Block Grant (CDBG) Program provides annual grants on a formula basis to states, cities, and counties to develop viable urban communities by providing decent housing and a suitable living environment, and by expanding economic opportunities, principally for low- and moderate-income persons. The program is authorized under Title 1 of the Housing and Community Development Act of 1974, Public Law 93-383, as amended 42 U.S.C. 5301 et seq.

Purpose: The purpose of this grant program is to assist in the development of communities with respect to the development of housing, suitable living environments and economic opportunities primarily for persons with low and moderate incomes.

Description: The program funds the following eligible project categories:

- Economic Development,
- Homeownership Assistance,
- House Rehabilitation,
- Housing Acquisition,
- Land Acquisition to Support New Housing
- Microenterprise Programs,
- New Housing Construction or
- Public Facilities and Improvements

Eligible Project Activities:

- Acquisition of real property,
- Disposition of real property,
- Acquisition, construction, reconstruction, rehabilitation or installation of public facilities and improvements,
- Clearance, demolition and removal of buildings and improvements,
- Provision of public services which are directed toward improving the community's public services and facilities,
- Privately owned utilities including the acquisition, construction, reconstruction, rehabilitation or installation of distribution lines and facilities of privately-owned utilities,
- Assistance to facilitate economic development,
- Technical assistance,
- Digital literacy classes as a public service under 24 CFR 570.201(e),
- Assistance to institutions of Higher Education and
- Homeownership assistance.

Eligible Applicants: Eligible Entitlement applicants include:

- Principal cities of Metropolitan Statistical Areas (MSAs)
- Other metropolitan cities with populations of at least 50,000
- Qualified urban counties with populations of at least 200,000 (excluding the population of entitled cities)

Eligibility for participation as an entitlement community is based on population data provided by the U.S. Census Bureau and metropolitan area delineations published by the Office of Management and Budget. HUD determines the amount of each entitlement grantee's annual funding allocation by a statutory dual formula which uses several objective measures of community needs, including the extent of poverty, population, housing overcrowding, age of housing and population growth lag in relationship to other metropolitan areas.

Total Funding Available (Based on FY 2022 Appropriations):

- $3.475 Billion

Award Floor: Not specified

Award Ceiling: Limit determined by formula-based allocation

Grant Match: No match or cost share is required for this program, however applicants who leverage other funds.

Period of Performance: The length of the project period is generally based on the implementation schedule submitted by the applicant and approved by HUD.

Special Requirements: It is required that the applicant demonstrate that at least 70% of the grant funding will be utilized for activities that benefit Low-to-Moderate Income persons in accordance with 24 CFR 1003.208. Low-to-Moderate Income means a family, household or individual whose income does not exceed 80% of the median income for the area.

The program requires Grant recipients to comply with various federal statutes and regulations including,

- NEPA Environmental Requirements,
- Flood Hazard Area Precautions,
- Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970,
- Americans with Disabilities Act and
- Non-Duplication of Services

Program Point of Contact(s): A listing of U.S. Department of Housing and Urban Development offices can be found here.

Choice Neighborhoods – Planning

CFDA Number: 14.892

Application Deadline: July 28, 2022

Overview: This program helps communities transform neighborhoods by redeveloping severely distressed public and/or HUD assisted housing and catalyzing improvements in the neighborhood, property, housing, businesses, services and schools.

Purpose: The purpose of this grant program is to leverage public and private investment to support locally driven strategies that address struggling neighborhoods through a comprehensive approach for transformation.

Description: The program funds the following eligible project categories:

- Planning and
- Action Activities

Eligible Project Activities (Planning Category):

- Performing comprehensive needs assessments to inform the development of the Transformation Plan,
- Performing comprehensive and integrated planning that addresses the challenges and gaps in services and assets identified through the needs assessments,
- Conducting technical planning studies concerning local development issues, priorities or suggested approaches,
- Developing Transformation Plans, including governance strategy that will provide long-term accountability and secure commitments to collaborate long-term to ensure successful implementation,
- Conducting public hearings, meetings, websites, etc. for stakeholder involvement regarding the Transformation Plan,
- Data collection and analysis to track impacts and
- Conducting site visits, research or participating in community of practice.

Eligible Project Activities (Action Activities Category):

- Reclaiming and recycling vacant property into community gardens, pocket parks, farmers markets or land banking (with maintenance),

Beautification, placemaking and community arts projects, such as creative signage to enhance neighborhood branding, murals and sculptures, specialty streetscaping or garden tool loan programs,

- Owner-occupied home or business façade improvement programs,
- Neighborhood broadband/WiFi infrastructure and installation (service not eligible through the grant),
- Fresh food initiatives, such as farmers markets and mobile fresh food vendors and
- Gap financing for economic development projects that are ready for implementation.

Eligible Applicants: Eligible applicants include:

- Public Housing Authorities,
- Local governments,
- Tribal entities and
- Non-profits who hold a 501(c) status.

Regarding Public Housing Authorities in Troubled Status, HUD will determine whether the entity is eligible to apply for the grant.

Total Funding Available (Based on FY 2022 Appropriations):

- $5 Million

Award Floor: Not specified

Award Ceiling: $450,000

Grant Match: 5%

Period of Performance: 24 Months (Planning Grant); 42 Months (Planning and Action Grant)

Special Requirements: The program requires Grant recipients to comply with the following special statutes and regulations including:

- Resolution of Civil Rights Matters,
- Outstanding Delinquent Federal Debts,
- Debarments and/or Suspensions,
- Pre-selection Review of Performance,
- Sufficient of Financial Management System,
- False Statements,
- Mandatory Disclosure Requirement,
- Prohibition Against Lobbying Activities and
- Equal Participation of Faith-Based Organizations in HUD Programs and Activities

The program also requires Grant recipients to comply with the following additional requirements:

- NEPA Environmental Requirements,
- Flood Hazard Area Precautions,
- Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970,
- Americans with Disabilities Act and
- Non-Duplication of Services.

Program Point of Contact(s): The Choice Neighborhoods Program Office can be contacted by E-mail here.

Choice Neighborhoods – Implementation

CFDA Number: 14.889

Application Deadline: February 15, 2022 (Next cycle anticipated in late 2022/early 2023)

Overview: This program helps communities transform neighborhoods by redeveloping severely distressed public and/or HUD assisted housing and catalyzing improvements in the neighborhood, property, housing, businesses, services and schools.

Purpose: The purpose of this grant program is to leverage public and private investment to support locally driven strategies that address struggling neighborhoods through a comprehensive approach for transformation.

Description: The Choice Neighborhoods is focused on three core goals:

1. Housing: Replace severely distressed public and assisted housing with high-quality mixed-income housing that is well-managed and responsive to the needs of the surrounding neighborhood;

2. People: Improve outcomes of households living in the target housing related to employment and income, health, and children's education; and

3. Neighborhood: Create the conditions necessary for public and private reinvestment in distressed neighborhoods to offer the kinds of amenities and assets, including safety, good schools, and commercial activity, that are important to families' choices about their community.

Eligible Project Activities:

- Construction, acquisition or rehabilitation of public, assisted, and affordable housing (available to households earning 80 -120 percent of AMI) that incorporates sustainable design principles, including energy efficiency,
- Acquisition, demolition or disposition of properties, including Federal Housing Administration-Real Estate Owned properties,
- Providing supportive supports for residents,
- Partnering with employers and for-profit and non-profit organizations to create jobs and job training opportunities,
- Relocation assistance under Section 8 of the United States Housing Act of 1937,
- Activities that promote sustainable neighborhoods and incorporate principles of sustainable design and development,
- Critical community improvements as define further below,
- Endowments,
- Conversion of vacant or foreclosed properties,
- Architectural and engineering work,
- Administrative costs and
- Legal fees.

The program also allows for up to 15% of funding to be utilized for Critical Community Improvements for the following activities:

- Financing for commercial and economic development projects,
- Neighborhood business façade improvement programs,
- Place-making projects,
- Neighborhood broadband,
- Revolving loan funds for business attraction and retention,
- Streetscape improvements above and beyond the locality's norm,
- Programs to improve housing in the neighborhood surrounding the target housing subject of this application and
- Acquisition of underutilized land for new parks, community gardens, community facilities or other uses approved by HUD.

Eligible Applicants: Eligible applicants include:

- Public Housing Authorities,
- Local governments,
- Tribal entities and
- Non-profits who hold a 501(c) status.

Total Funding Available (Based on FY 2022 Appropriations):

- $195 Million

Award Floor: Not specified

Award Ceiling: $35 Million

Grant Match: 5%

Period of Performance: 72 Months

Special Requirements: The program requires Grant recipients to comply with the following special statutes and regulations including:

- Resolution of Civil Rights Matters,
- Outstanding Delinquent Federal Debts,
- Debarments and/or Suspensions,
- Pre-selection Review of Performance,
- Sufficient of Financial Management System,
- False Statements,
- Mandatory Disclosure Requirement,
- Prohibition Against Lobbying Activities and
- Equal Participation of Faith-Based Organizations in HUD Programs and Activities

The program also requires Grant recipients to comply with the following additional requirements:

- NEPA Environmental Requirements,
- Flood Hazard Area Precautions,
- Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970,
- Americans with Disabilities Act and
- Non-Duplication of Services.

Program Point of Contact(s): The Choice Neighborhoods Program Office can be contacted by E-mail here.

U.S. Department of Transportation

Rebuilding American Infrastructure With Sustainability and Equity (RAISE) Grant Program

CFDA Number: 20.933

Application Deadline: April 14, 2022 (Next cycle anticipated in late 2022/early 2023)

Overview: The Consolidated Appropriations Act, 2021 (Pub. L. 116-260) appropriated $1 billion to be awarded by the U.S. Department of Transportation ("DOT") for National Infrastructure Investments (now known as Rebuilding American Infrastructure with Sustainability and Equity (RAISE) Grants.) RAISE Grants (formerly known as the BUILD grant) are for capital investments in surface transportation that will have a significant local or regional impact.

Purpose: The focus of this program is to fund critical improvements to local, state, and federal transportation infrastructure that result in good-paying jobs, improve safety, apply transformative technology, and explicitly address climate change and racial equity.

Description: The program funds the following eligible broadband related project aspects:

- Innovative Technologies including:
  - Conflict detection and mitigation technologies (e.g., intersection alerts and signal prioritization);
  - Dynamic signaling, smart traffic signals, or pricing systems to reduce congestion;
  - Traveler information systems, to include work zone data exchanges;
  - Signage and design features that facilitate autonomous or semi-autonomous vehicle technologies;
  - Applications to automatically capture and report safety-related issues (e.g., identifying and documenting near-miss incidents);
  - Vehicle-to-Everything V2X Technologies (e.g. technology that facilitates passing of information between a vehicle and any entity that may affect the vehicle);
  - Vehicle-to-Infrastructure (V2I) Technologies (e.g., digital, physical, coordination, and other infrastructure technologies and systems that allow vehicles to interact with transportation infrastructure in ways that improve their mutual performance);
  - Vehicle-to-Grid Technologies (e.g., technologies and infrastructure that encourage electric vehicle charging, and broader sustainability of the power grid);
  - Cybersecurity elements to protect safety-critical systems;
  - Broadband deployment and the installation of high-speed networks concurrent with the transportation project construction;
  - Technology at land and sea ports of entry that reduces congestion, wait times, and delays, while maintaining or enhancing the integrity of our border;
  - Work Zone data exchanges or related data exchanges; or
  - Other Intelligent Transportation Systems (ITS) that directly benefit the project's users.

Eligible Project Activities:

- Planning

Activities eligible for funding under RAISE planning grants are related to the planning, feasibility, preparation, or design of eligible surface transportation capital projects.

- Capital Projects

Eligible projects for RAISE grants are surface transportation capital projects within the United States or any territory or possession of the United States that include, but are not limited to:

1. highway, bridge, or other road projects eligible under title 23, United States Code;
2. public transportation projects eligible under chapter 53 of title 49, United States Code;
3. passenger and freight rail transportation projects;
4. port infrastructure investments (including inland port infrastructure and land ports of entry);
5. intermodal projects; and
6. projects investing in surface transportation facilities that are located on Tribal land and for which title or maintenance responsibility is vested in the Federal Government.

Eligible Applicants: Eligible applicants include:

- State, local, Tribal and U.S. territories' governments
- Transit agencies
- Port Authorities
- Metropolitan Planning Organizations (MPOs)
- Other political subdivisions of State or local governments

Total Funding Available: $1.5 Billion

Award Floor:

- Capital Projects: $5 Million/$1 Million (Rural Areas)
- Planning: There is no minimum award size for RAISE planning grants, regardless of location.

Award Ceiling: $25 Million

Grant Match: 20%

Period of Performance: All FY 2022 RAISE funds must be expended by September 30, 2030.

Special Requirements:

The primary selection criteria are:

- safety,
- environmental sustainability,
- quality of life,
- economic competitiveness, and
- state of good repair.

The secondary selection criteria are:

- partnership and
- innovation.

If an applicant is proposing to adopt innovative technology, the application should demonstrate the applicant's capacity to implement those innovations and understanding of applicable Federal requirements, including permitting, approvals, exemptions, waivers, or other procedural actions, and the effects of those innovations on the project delivery timeline. Additionally, each applicant selected for RAISE grant funding must demonstrate effort to consider climate change and environmental justice impacts and improve racial equity and reduce barriers to opportunity.

The program also requires Grant recipients to comply with the following additional requirements:

- NEPA Environmental Requirements,
- Flood Hazard Area Precautions,
- Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970,
- Americans with Disabilities Act and
- Non-Duplication of Services.

Program Point of Contact(s): The RAISE Grant Program Office can be contacted by E-mail here.

United States Department of Homeland Security - Federal Emergency Management Agency

Building Resilient Infrastructure and Communities

CFDA Number: 97.047

Application Deadline: January 27, 2023

Overview: The Building Resilient Infrastructure and Communities (BRIC) program makes federal funds available to states, U.S territories, Indian tribal governments, and local communities for pre-disaster mitigation activities.

Purpose: The guiding principles of the program are to:

1. support state and local governments, tribes, and territories through capability- and capacity-building to enable them to identify mitigation actions and implement projects that reduce risks posed by natural hazards;
2. encourage and enable innovation while allowing flexibility, consistency, and effectiveness;
3. promote partnerships and enable high-impact investments to reduce risk from natural hazards with a focus on critical services and facilities, public infrastructure, public safety, public health, and communities;
4. provide a significant opportunity to reduce future losses and minimize impacts on the Disaster Relief Fund; and
5. support the adoption and enforcement of building codes, standards, and policies that will protect the health, safety, and general welfare of the public, take into account future conditions, and have long-lasting impacts on community risk reduction, including for critical services and facilities and for future disaster costs.

Description: The program funds the following eligible project categories:

- Capacity and Capacity-Building (C&CB)
  - Activities which enhance the knowledge, skills, expertise, etc., of the current workforce to expand or improve the administration of mitigation assistance.
  - This includes activities in the following sub-categories:
  - building codes activities,
  - partnerships,
  - project scoping,
  - mitigation planning and planning-related activities,
  - and other activities
- Mitigation Projects
  - Cost-effective projects designed to increase resilience and public safety; reduce injuries and loss of life; and reduce damage and destruction to property, critical services, facilities, and infrastructure.
- Management Costs
  - Financial assistance to reimburse the Recipient and subrecipient for eligible and reasonable indirect costs, direct administrative costs, and other administrative expenses associated with a specific mitigation measure or project
- Direct Technical Assistance
  - Assistance to build a community's capacity and capability to improve its resiliency to natural hazards and to ensure stakeholders are capable of building and sustaining successful mitigation programs, submitting high-quality applications, and implementing new and innovative projects that reduce risk from a wide range of natural hazards.

Eligible Applicants: Eligible applicants include:

- States,
- District of Columbia,
- U.S. Territories and
- Indian Tribal Governments, as defined in 25 U.S.C. 450b

According to the Notice of Funding Opportunity, local governments, including cities, townships, counties, special district governments, and Indian tribal governments (including federally recognized tribes who choose to apply as subapplicants) are considered subapplicants and must submit subapplications for financial assistance or letters of interest for non-financial Direct Technical Assistance to their state/territory/tribal Applicant agency.

In addition to eligibility requirements listed above, applicants must also meet the following eligibility requirements:

- Subapplicants are required to have a FEMA-approved Local or Tribal Hazard Mitigation Plan in accordance with 44 CFR Part 201 by the Application deadline and at the time of obligation of grant funds for mitigation projects and C&CB activities (with the exception of mitigation planning).
- States and territories that have had a major disaster declaration under the Stafford Act in the 7 years prior to the annual Application period start date are eligible to apply to FEMA for federal assistance under BRIC (Applicants). As a result of numerous major disaster declarations, all states, territories, and the District of Columbia are eligible to apply in FY2020.

Total Funding Available (Based on FY 2022 Appropriations):

- $500 Million

Award Floor: Not specified

Award Ceiling: $600,000 (State Allocation); $50,000,000 (National Competition)

Grant Match: 25%

Period of Performance: 36 Months

Special Requirements: The program requires Grant recipients to comply with the following special statutes and regulations including:

Resolution of Civil Rights Matters,

- Outstanding Delinquent Federal Debts,
- Debarments and/or Suspensions,
- Pre-selection Review of Performance,
- Sufficient of Financial Management System,
- False Statements,
- Mandatory Disclosure Requirement,
- Prohibition Against Lobbying Activities and

The program also requires Grant recipients to comply with the following additional requirements:

- NEPA Environmental Requirements,
- Flood Hazard Area Precautions,

- Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970,
- Buy American
- Americans with Disabilities Act and
- Non-Duplication of Services.

Mitigation projects must be cost-effective and designed to increase resilience and reduce risk of injuries, loss of life, and damage and destruction of property, including critical services and facilities. This means the project, as documented by the Applicant, achieves the following goals:

- Addresses a problem that has been repetitive or that poses a risk to public health and safety and improved property if left unresolved;
- Satisfies applicable cost-effectiveness requirements through completion of a Benefits-to-Cost Analysis (BCA) conducted in compliance with OMB Circular A-94 as discussed in Section A.10, Performance Metrics;
- Contributes, to the extent practicable, to a long-term solution to the problem it is intended to address; and
- Accounts for long-term changes to the areas and entities it protects and has manageable future maintenance and modification requirements.

Program Point of Contact(s): A listing of State Hazard Mitigation Officers (SHMOs) can be found here.

Federal Broadband Grant Programs (Secondary)

In addition to the federal broadband grant programs listed as primary matches, Defiance County may consider seeking additional funding opportunities through the following agencies and programs with other eligible applicants:

United States Department of Education

- Governor's Emergency Education Relief Fund (GEER)
- Elementary and Secondary School Emergency Relief Fund (ESSER)
- Higher Education Emergency Relief Fund
- Impact Aid Programs
- Promise Neighborhoods Programs
- Rural, Low-Income School (RLIS) Program
- Small, Rural School Achievement (SRSA) Program
- Title I, Part A. Improving Basic Programs Operated by Local Education Agencies Program
- Title III, Part A. Strengthening Institutions Program
- Title IV, Part A. Student Support and Academic Enrichment Program

United States Department of Labor – Employment and Training Administration

- Workforce Development in Telecommunications Sector: Apprenticeship Investments in Support of Broadband and 5G

United States Department of Treasury – Office of the Comptroller of the Currency (OCC)

- Community Reinvestment Act (CRA) Program

Federal Communications Commission – Universal Service Administrative Company

- E-Rate (Schools and Libraries) Program
- High Cost Program (CAF, RDOF & 5G Fund)
- Rural Health Care Program

National Science Foundation (NSF)

- Campus Cyberinfrastructure (CC*) Program
- Smart and Connected Communities (S&CC) Program
- Spectrum and Wireless Innovation Enabled by Future Technologies (SWIFT) Program

State Broadband Grant Program Eligibility

Ohio Department of Development - BroadbandOhio

Ohio Residential Broadband Expansion Grant Program

Purpose: The program awards grants to internet service providers to fund the construction of broadband projects in unserved (areas below 10 Mbps download and 1 Mbps upload) and underserved (areas below 25 Mbps download and 3 Mbps upload) areas of the state. The program is administered by BroadbandOhio, a division of the Ohio Department of Development.

Grants are provided to internet service providers to help with the cost of expanding into unserved and underserved areas of Ohio. The grants are designed to help with the infrastructure costs of the project and help build the networks in areas that lack high-speed internet. The grants will cover the "broadband funding gap," which is the difference between the total amount of money a broadband provider calculates is necessary to construct the last mile of a specific broadband network and the total amount of money that the provider has determined is the maximum amount of money that is cost effective for the provider to invest in last mile construction for that network.

Eligible Applicants: Only broadband providers are eligible to apply for the program.

Total Funding Available:

- $250 Million

Grant Match: No grant match was specified during the initial round of ORBG funding due to the program being a gap program.

The first round of ORBG grant applications were requested by BroadbandOhio on August 6, 2021 and awards were announced in late March 2022. Additional information, including the Application Packet, guidelines and broadband mapping data, is available at: https://broadband.ohio.gov/grant-opportunities/grant-opportunities-1/grant-opportunities-1

Section II. Evaluation of Project Opportunities

Funding Needs Matrix

Opportunity	Planning	Design	Construction	Equipment / Devices
Middle Mile (Backbone)	X	X	X	X
Last Mile (FTTP)	X	X	X	X
Wireless	X	X	X	X
Telehealth	X	X	X	X
Economic Development	X	X	X	X
Emergency Response	X	X	X	X
Distance Learning	X	X	X	X

Eligible Project Activities

Project	Needs	Agency	Potential Funding Program(s)
Middle Mile (Backbone)	Planning, Design, Construction & Equipment	DHS-FEMA USDA-RD USDOC-NTIA	• Building Resilient Infrastructure and Communities (BRIC) • ReConnect Pilot Program • Rural Broadband Access Loan and Loan Guarantees • Broadband Equity, Access, and Deployment (BEAD) Program • Enabling Middle Mile Broadband Infrastructure Program

Project	Needs	Agency	Potential Funding Program(s)
Last Mile (FTTP)	Planning, Design, Construction & Equipment	USDOC-NTIA USDA-RD USDHUD	• Broadband Equity, Access, and Deployment (BEAD) Program • ReConnect Pilot Program • Rural Broadband Access Loan and Loan Guarantees • Telecommunications Infrastructure Loans and Loan Guarantees • Community Development Block Program • Choice Neighborhoods - Implementation • Choice Neighborhoods - Planning
Telehealth Economic Development Emergency Response Distance Learning	Planning, Design, Construction & Devices	FCC-USAC USDA-RD USDHUD DHS-FEMA	• Rural Health Care Program • E-Rate (Schools and Libraries) Program • Community Connect Grant Program • Distance Learning and Telemedicine Grant • ReConnect Pilot Program • Rural Broadband Access Loan and Loan Guarantees • Community Development Block Program • Choice Neighborhoods - Implementation • Choice Neighborhoods - Planning • Building Resilient Infrastructure and Communities (BRIC)

ACRONYMS:
DHS - FEMA: Department of Homeland Security - Federal Emergency Management Agency
FCC - USAC: Federal Communications Commission - Universal Service Administrative Company
USDA-RD: United States Department of Agriculture - Rural Development
USDOC-EDA: United States Department of Commerce - Economic Development Administration
USDOC-NTIA: National Telecommunications and Information Administration
USDHUD: United States Department of Housing and Urban Development

Project Opportunities

Middle Mile (Backbone)

Description of Project: In order to establish a foundation for last mile connectivity for the County, a backbone network will need to be constructed first. Backbone networks typically consist of a ring (or rings) of fiber optic cable connecting different areas of a municipality or region. The ring topology has the advantage of being resilient (redundancy network) against single fiber cuts or other faults. One business opportunity for the County with the backbone ring is connecting local large and mid-sized businesses with internet connectivity. Lit analyzed GIS data to create an initial design for the County's backbone network. From this data, Lit created a financial model to quantify the cost of building the Middle Mile network and the potential revenue opportunities for the County. Lit is proposing the development of 110 miles of middle mile backbone infrastructure throughout Defiance County and connecting 39 community anchor institutions.

Scope of Work: The backbone network deployment is broken up into four major phases including Assessment, Engineering, Construction, and Operations as shown on the 'Expenses' tab of the Financial Model.

1. Assessment

The total costs for the Assessment Phase are assumed to be $0 since the County will have already paid for the cost of the Broadband Community Assessment.

2. Engineering

The total costs for the Engineering Phase are $1,239,976 and includes the Tasks, Unit of Measure, Volume, Unit Cost, and Total Cost shown below. These tasks will all be completed during months 1-12.

3. Construction

The total costs for the Construction Phase are $10,278,026 (less material waste) and includes the Tasks, Unit of Measure, Volume, Unit Cost, and Total Cost. The final pricing for this phase will be established during the Engineering Phase, and the Financial Model will be reflected accordingly.

4. Operations & Maintenance

The total costs for the Operations Phase during the construction period is $733,557 and includes the Tasks, Unit of Measure, Volume, Unit Cost, and Total Cost. The recurring monthly costs for O&M are estimated to be $11,750 for the majority of the 20-year period.

Potential Grant Funding Sources:

Department of Homeland Security - Federal Emergency Management Agency

- Building Resilient Infrastructure and Communities

United States Department of Agriculture - Rural Development

- ReConnect Program
- Rural Broadband Access Loan and Loan Guarantees

United States Department of Commerce – National Telecommunications and Information Administration

- Broadband Equity, Access, and Deployment (BEAD) Program
- Enabling Middle Mile Broadband Infrastructure Program

Last Mile (FTTP)

Description of Project: The County contracted Lit to perform a preliminary design for a defined a preliminary service area - deriving 18,903 potential residential customers and 159 potential small business customers, for a grand total of 19,062 total customers or demand points. Using the Preliminary Design and pole digitization, we've assumed 65% aerial and 35% underground build in the Right of Way ("ROW") for the County's FTTH Partner network. Aerial deployment typically is one of the most cost-effective methods of deploying fiber to customers, because of the ability to leverage existing pole lines and avoiding additional costs of digging up roads or burying cables.

Scope of Work: The last mile network deployment for 19,062 demand points are broken up into four major phases including Assessment, Engineering, Construction, and Operations as shown on the 'Expenses' tab of the Financial Model.

1. Assessment

The total costs for the Assessment Phase are assumed to be $0 since the County will have already paid for the cost of the Broadband Community Assessment.

2. Engineering

The total costs for the Engineering Phase are $4,082,259 and includes the Tasks, Unit of Measure, Volume, Unit Cost, and Total Cost. These tasks will all be completed during months 1-6.

3. Construction

The total costs for the Construction Phase are $70,665,251 (less material waste) and includes the Tasks, Unit of Measure, Volume, Unit Cost, and Total Cost. The final pricing for this phase will be established during the Engineering Phase, and the Financial Model will be reflected accordingly.

4. Operations & Maintenance

The total costs for the Operations Phase during the construction period is $18,736,822 and includes the Tasks, Unit of Measure, Volume, Unit Cost, and Total Cost shown below. The recurring monthly costs for O&M are estimated to be between $32,280 and $81,910 for the majority of the 20-year period as shown on the financial model.

Potential Grant Funding Sources:

United States Department of Commerce – National Telecommunications and Information Administration

- Broadband Equity, Access, and Deployment (BEAD) Program

United States Department of Agriculture - Rural Development

- ReConnect Program
- Rural Broadband Access Loan and Loan Guarantees
- Telecommunications Infrastructure Loans and Loan Guarantees

United States Department of Housing and Urban Development

- Community Development Block Program
- Choice Neighborhoods – Planning
- Choice Neighborhoods - Implementation

Ohio Department of Development - BroadbandOhio

- Ohio Residential Broadband Expansion Grant Program

Telehealth

Description of Need: If Defiance County is interested in seeking grant funding opportunities outside of the Rural Healthcare Program, there are no federal broadband grants that provide funding for Operational Expenses. However, there are opportunities to pursue funding for infrastructure development, connectivity and equipment.

Example Projects: The programs listed below can be utilized to fund various aspects of healthcare, telemedicine and connectivity for commercial, residential and institutional users. Outside of the FCC & USAC's Rural Health Care Program which subsidizes the cost of broadband connectivity for Rural Healthcare providers and the USDA-RD's Distance Learning and Telemedicine Grant which provides funding for telemedicine equipment and broadband connectivity to eligible rural sites, the remaining programs can be utilized to fund broadband infrastructure and connectivity to enable enhanced healthcare and telemedicine capabilities.

For example, funding from the federal grant programs below can be utilized to:

- Plan, design and construct fixed wireless and broadband middle mile, backhaul and FTTP infrastructure for:
  - Local hospitals, healthcare facilities and clinics,
  - Private healthcare corporations that manufacture and produce healthcare and telemedicine equipment and
  - Eligible public housing areas where residents can participate in telemedicine and enhanced connectivity to healthcare providers,
- Provide and enhance broadband connectivity to local Institutions of Higher Education and Workforce Development agencies for remote learning, job training, apprenticeships and technical support careers within the healthcare industry and
- Provide and enhance broadband connectivity to libraries to provide devices and connectivity to foster wellness and health literacy.

Potential Grant Funding Sources:

United States Department of Agriculture - Rural Development

- Distance Learning and Telemedicine Program
- Community Connect Grant Program
- ReConnect Program
- Rural Broadband Access Loan and Loan Guarantees

United States Department of Housing and Urban Development

- Community Development Block Program
- Choice Neighborhoods - Planning
- Choice Neighborhoods - Implementation

Economic Development

Description of Need: If Defiance County is interested in seeking grant funding opportunities that support broadband infrastructure development for economic development projects that are strategically aligned within their existing network, funding is available to support those initiatives.

Example Projects: The programs listed below can be utilized to fund various aspects of economic development in existing and future broadband and fixed wireless service areas to enable job creation, private investment and economic resiliency. While Defiance County is not eligible for EDA Public Works and Economic Adjustment Assistance funding, efforts to fund broadband and fixed wireless infrastructure is likely to be supported due to it serving as a catalyst to attract investment from private corporations that require the greatest speeds available for data centers, software development, manufacturing, etc. Through the addition of economic development aspects in the County's projects, these areas will have the greatest potential to stimulate local entrepreneurship, job creation, skills training and workforce opportunities.

For example, funding from the federal grant programs below can be utilized to:

- Plan, design and construct fixed wireless and broadband middle mile, backhaul and FTTP infrastructure for:
  - Innovation districts,
  - Private industry in area downtown and business districts,
  - Industrial parks, data centers and major ports of entry that require broadband fiber infrastructure for operations.
  - Provide and enhance broadband connectivity to local Institutions of Higher Education and Workforce Development agencies for remote learning, job training, apprenticeships and technical support careers.

Potential Grant Funding Sources:

United States Department of Agriculture - Rural Development

- Community Connect Grant Program
- ReConnect Program
- Rural Broadband Access Loan and Loan Guarantees

Emergency Response

Description of Need: If Defiance County is interested in seeking grant funding to harden its telecommunications and emergency response infrastructure, opportunities are available to assist with meeting those needs.

Example Projects: The program listed below can be utilized to fund various aspects of broadband and wireless network infrastructure with regards to enhancing local, state and federal emergency response capabilities and preparedness. The County has the potential to coordinate with respective first responder, law enforcement authorities and public safety entities to evaluate opportunities to upgrade the quality and capabilities of existing communications and network infrastructure to accommodate the next generation of equipment, software and tools being utilized to reduce response time, detect gun fire weapon use and location and save lives during emergencies and natural disaster situations. By working closely with these agencies, Defiance County can play a significant role in the communities they serve, increase safety and resiliency during and after emergencies.

For example, funding from the federal grant programs below can be utilized to:

- Plan, design and construct fixed wireless and broadband middle mile, backhaul and FTTP infrastructure for:
  - First responders,
  - Emergency operations centers,
  - Local law enforcement authorities,
  - State emergency management agencies,
  - Federal law enforcement and disaster response agencies,
  - Shelters and
  - Community-wide capabilities to disseminate emergency notifications, announcements, etc.

Potential Grant Funding Sources:

Department of Homeland Security - Federal Emergency Management Agency

- Building Resilient Infrastructure and Communities

Distance Learning

Description of Need: If Defiance County is interested in seeking grant funding to expand capacity of existing and planned broadband and wireless infrastructure, opportunities are available to support distance learning and provide a high-end mobile device that will acquire cellular networks and provide limited broadband services on school buses and bookmobiles.

Example Projects: The programs listed below can be utilized to fund various aspects of enhanced broadband and wireless infrastructure for School Bus / Bookmobiles to allow students to connect to the internet while commuting to and from school. While the E-Rate Schools and Libraries Program currently does not allow for wireless connectivity to School Bus / Bookmobiles, there are proponents of this technology advocating to the Federal Communications Commission and the Universal Service Administrative Company to modify the current eligible uses of E-Rate funding to allow for wireless connectivity to buses. Enhancing broadband and wireless connectivity for students who commute on school buses will be instrumental in closing the digital divide for families who cannot afford to subscribe to internet service for their residences. Until the E-Rate program can be utilized for this connectivity, there are a variety of other programs that can support the wireless and broadband fiber network infrastructure along bus routes leading to and from school facilities.

For example, funding from the federal grant programs below can be utilized to:

- Plan, design and construct fixed wireless and broadband middle mile, backhaul and FTTP infrastructure along bus routes leading to Elementary, Intermediate and High Schools and priority areas of interest where distance learning gaps are prevalent.

Potential Grant Funding Sources:

United States Department of Agriculture - Rural Development

- Community Connect Grant Program
- Distance Learning and Telemedicine Grant
- ReConnect Program
- Rural Broadband Access Loan and Loan Guarantees

United States Department of Housing and Urban Development

- Community Development Block Program
- Choice Neighborhoods - Planning
- Choice Neighborhoods - Implementation

Section III. Preparing for Grant Funding Opportunities

Based on our previous experience working with other communities regarding the development of funding applications, we would like to propose several studies that we recommend completing prior to applying for federal grant funding opportunities. Each of these documents are required by the funding agencies in order to satisfy various programmatic and federal requirements and their completion ahead of time provides greater flexibility for the County when considering multiple avenues of funding the proposed network solution.

Below are several studies that are uniform requirements for seeking federal funding:

- Preliminary and Final Engineering Feasibility Report (EFR)
  - The Preliminary and Final EFR is the document that is utilized by the funding agencies to understand the needs and existing conditions of the community and the proposed solution to address those needs. The EFR includes an overview of the project's scope, size, cost and alignment with the communities' priorities (i.e. closing the Digital Divide, economic development, workforce development, etc.). Typically, funders will accept a Preliminary EFR during the grant application phase and once funding is awarded, the agency will provide comments based on their review to finalize the document. Prior to the release of funding for construction, most funding agencies will require the EFR to be approved to ensure project feasibility.
- General Application Information
  - Depending on the nature of the grant, applicants are required to provide some general application information including a project description, stakeholders involved, documenting public and business support, anticipated economic impact, alignment with the agency and grant programs goals and objectives, project schedule, and proposed equipment.
- Proforma
  - Federal agencies typically request a proforma that projects fiscal expenditures (planning/design, construction, and operations) and revenue over a long-term period, 10 - 20 years, etc., to understand the financial sustainability of the project.
- Environmental Narrative
  - To satisfy National Environmental Policy Act requirements, applicants seeking federal funding must provide information to the funding agency regarding the project's potential impact on the environment. Since a variety of federal regulations exist, such as the Clean Water Act, Clean Air Act, Endangered Species Act, etc. it is important for the applicant to document how the proposed project impacts the environment. For projects that are located in environmentally sensitive areas such as wetlands, brownfields, preservation areas, etc. it is critical that the applicant document how the project will not negatively impact the environment. Typically, the federal funding agency will review the Environmental Narrative/Questionnaire to determine if any additional studies are required prior to issuing a Finding of No Significant Impact (FONSI). If additional studies are required such as Archeological, Air Quality, or Geotechnical surveys, the federal funding agency will require that these be completed prior to issuing a FONSI and beginning construction activities. Additionally, the federal funding agency may require coordination with other federal agencies (i.e. United States Army Corps of Engineers, Fish and Wildlife, Department of Interior, etc.) for their respective reviews prior to issuing a FONSI.

Through our team's past experience applying and obtaining financial assistance, we have consistently observed that communities who have the proper engineering and technical information required to apply completed ahead of time are most prepared, confident, and competitive when seeking grant funding. Often, federal agencies only provide between 45 - 60 days for application submission which leaves very little time to begin these studies and assessment while the application period is open.

Therefore, if Defiance County is strongly interested in seeking grant funding to address its broadband infrastructure and accessibility gaps, we recommend that the County conduct these efforts as soon as possible so they are prepared and ready for future funding opportunities. Additionally, prior to applying for grant funding, it is strongly recommended that Defiance County coordinate closely with the Ohio Broadband Expansion Authority and other key stakeholders to ensure that the proposal is aligned with State planning efforts and to include the County's needs with respect to project costs to reach unserved and underserved areas. It is also important to note that partnerships with related stakeholders can possibly strengthen potential applications for funding, however more weight is given to partnerships that have been formally established prior to applying for funding. Lastly, due to the varying amount of local matching funding required to pursue these opportunities, we suggest that the County identify sources and amounts of matching funding to determine the respective capacity to secure grant funding.

Appendix E

Community Survey Data

Find the raw Survey Data here: https://tinyurl.com/DefianceCountySurvey

Appendix F

PRIVATE Network enterprises LLC

Report to Lit Communities and Defiance County, Ohio

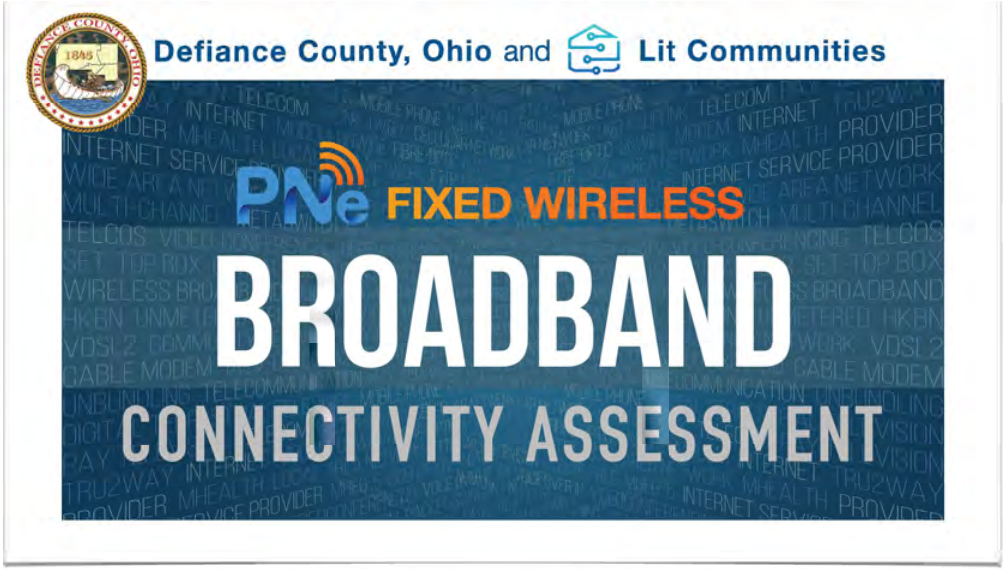
BROADBAND CONNECTIVITY ASSESSMENT

Fixed Wireless

Design and Planning for an Evolving Hybrid Network

Accessible Version

SPECIAL REPORT



Design and Planning for an Evolving Hybrid Network

Fixed Wireless

PREPARED FOR:

Defiance County, Ohio
Lit Communities

PREPARED BY:

PRIVATE Network enterprises LLC

TABLE OF CONTENTS

Executive Summary

1 .1 Introduction

Upon the request and engagement by Lit Communities and Defiance County, Ohio we were asked to provide a **Fixed Wireless Assessment** to the Project that Lit had underway regarding **"Broadband Modeling and Engineering Feasibility Plans"** for Defiance County.

PNe conducted a technical and cost analysis of fixed wireless broadband options to reach areas in Defiance County, Ohio unserved by broadband. Unserved areas are defined as areas equal to or less than 25 Mbps download and 3 Mbps upload.

We focused primarily on utilizing Citizens Broadband Radio Service (CBRS) in our design and engineering modeling, and other emerging, available spectrum and technologies that can deliver broadband performance.

This report documents PNe's analysis of fixed wireless broadband solutions using the available spectrum and technologies on a **county wide basis**, using available mapping and other resources, as well as information provided to us from Lit Communities and Defiance County, Ohio. PNe also relied on their personal experience in their deployment and operations of fixed wireless CBRS LTE networks.

Included is a short introduction to the necessary fixed **wireless network connectivity infrastructure** in **Section 2**.

Section 2 also has an overview summary of available **CBRS Spectrum** and describes the challenges and benefits of that spectrum. We relate that information to the fixed wireless network characteristics of a CBRS LTE wireless network design that we are utilizing in our work for this report. The RF propagation maps of our design are shown in **Section 4.**

We have also captured the associated capital costs, at high level, and the major factors that impact those costs, in the rest of the report and summarized it in **Section 5**.

1.2 Key Findings

The primary cost driver for a fixed wireless broadband solution can be spectrum, predominantly due to its technical characteristics. The farther a certain radio frequency can reach, the more locations it can cover lowering overall cost. The lower the frequency, the better it will penetrate or go around obstacles. Other cost drivers include the power authorized by the FCC for users in the band, the density of locations within a given coverage area, tower availability (building a new tower adds expense), tower lease costs (for available towers), and the service adoption rate.

The Educational Broadband Service (EBS) technology and spectrum is the best technological and financial fit for a fixed wireless broadband network. Specific channel groups availability in the county would need to be determined if available for sale, lease and/or stakeholder agreement.

The technological fit is due to the higher allowed operational power and the superior signal propagation, including through foliage and over challenging terrain. EBS spectrum is now available for purposes other than education, and many entities, such as mobile carriers, are taking advantage of its availability. EBS spectrum is allocated in 20 MHz “channel groups”; one channel group is sufficient in providing broadband service.

Due to the aforementioned technological advantages over other spectrum such as CBRS and unlicensed 5 GHz, EBS is also a more cost-effective spectrum solution. EBS’s superior signal propagation translates to more locations served from each tower (or other vertical structure used for service distribution in an area) and higher speeds.

This study used CBRS and/or unlicensed 5GHz for the propagation models included in this report.

Wireless Network Connectivity Infrastructure

2.1 Identification of Wireless network ownership

For the purposes of this Preliminary Assessment - wireless network ownership was not addressed. If the County decides to move forward - the issue of network and network infrastructure ownership will need to be determined. The pros and cons of ownership and the legal issues related to ownership will also need to be explored. Public Private Partnerships and key strategic stakeholder involvement can be explored as well, as alternatives to ownership.

2.2 Network Operations and Maintenance

For the purposes of this Preliminary Assessment - wireless network operations and maintenance like ownership was not addressed. If the County decides to move forward - with a Wireless component, this issue will also need to be considered and determined. The ownership issue needs to be determined first because it could affect the options considered for Network Operations and Maintenance. The pros and cons of operating and maintaining a wireless network and the legal issues related will also need to be explored. Again, Public Private Partnerships and key strategic stakeholder involvement can be explored as well, as alternatives for operating and maintaining a wireless network.

2.3 Components of wireless network infrastructure

There are three (3) key components required to have and operate a Fixed Wireless Network are:

1. Spectrum - licensed or unlicensed
2. Vertical Assets - Towers, buildings
3. Fiber assets - connecting the network equipment & components

Each of these will be discussed further on the following pages.

2.4 **Radio frequency spectrum** is one of the, if not the most critical component necessary to be able to plan, design, engineer and deploy a Wireless Network for any organization or business.

To make a long story short, **unlicensed and licensed spectrum is now available** for organizations to utilize and plan, design, engineer and deploy their very own custom Wireless Networks.

Increased spectrum availability - means more opportunity - to technologically transform day-to-day operations for education, health care, banking & commerce and the businesses in the energy and transportation industries just to name a few. The FCC made some fundamental changes after 9/11/2001 that ultimately led to this spectrum being available to the public & organizations not just a few telecommunications companies. Again with the COVID 19 pandemic crises, being the catalyst to accelerate the need for remote beyond the class room education and tele-health medical services. Connectivity Solutions are being sought out and in high demand.

At first glance, the **Citizens Broadband Radio Service (CBRS)** may sound like the name of a studio broadcast from radio's golden age, but its waves carry much more potential. CBRS is a versatile band of shared spectrum that's attracting immense interest in the use and expansion of Wireless/Cellular Networks. By tapping into the unique architecture and capabilities of **Citizens Broadband Radio Service(CBRS)**, enterprise businesses and organizations are bringing their dreams of remote digital automation and transformation to life.

What is CBRS?

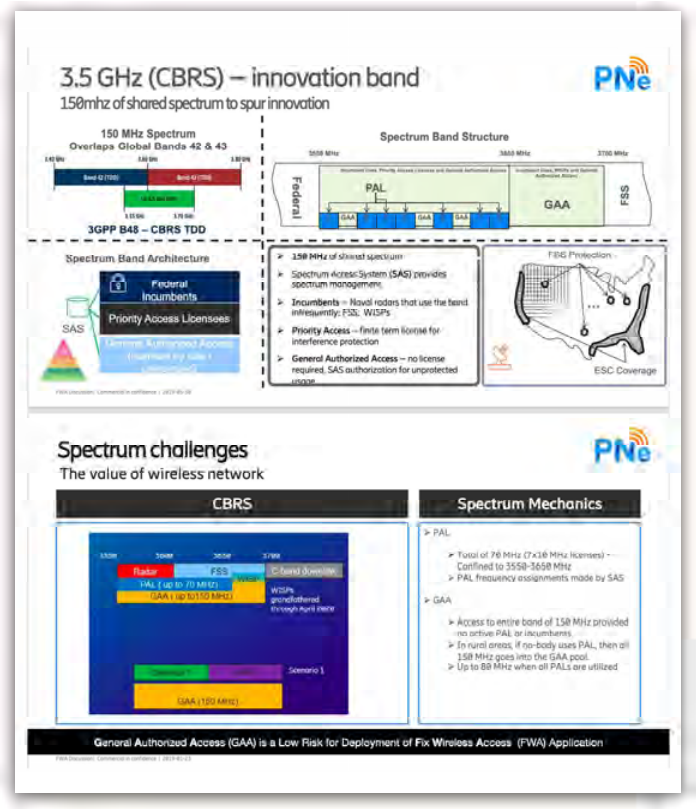
Citizens Broadband Radio Service (CBRS) is a band of radio frequency spectra operating in the 3.55-3.7 GHz range. The CBRS spectrum totals 150 MHz and is particularly unique because it is a shared spectrum that the Federal Communications

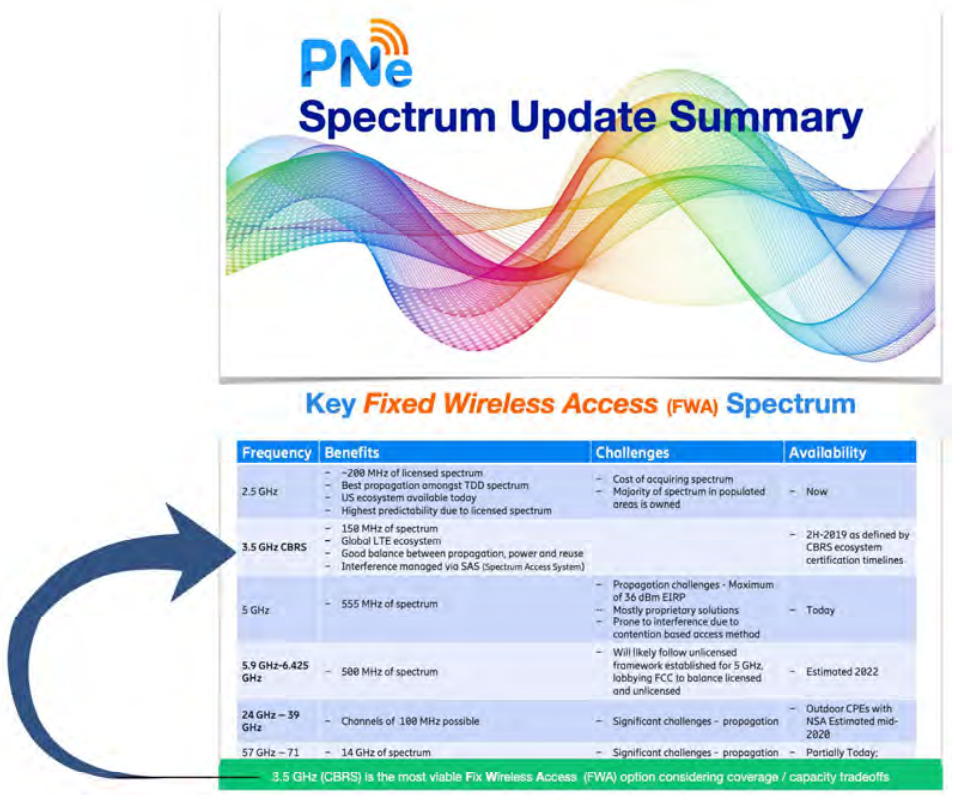
Commission (FCC) has divided it into three tiers, each occupied by users with different types of access. **See description and illustration below:**

- ***The incumbent access tier*** *is used solely by the U.S. Navy and commercial fixed satellite stations whose access is grandfathered and prioritized to protect them from interference.*

- ***The priority access tier*** *includes Priority Access License (PAL) holders, such as Internet service providers and enterprises users, who have purchased spectrum licenses from the FCC during auctions.*

- ***The General Authorized Access*** *(GAA) tier is composed of users who can access the CBRS spectrum for free using phones, laptops, home routers, etc., but are not given priority over incumbents or PAL users. Access to CBRS is managed and administered by a group of Spectrum Access Systems (SAS) providers, including Amdocs, CommScope, Federated Wireless, Google, CommScope, and Sony, who determine appropriate level of access for each user. CBRS is distinct not only because of its shared architecture, but also because of its potential to offload traffic for wireless carriers and mobile virtual network operators (MVNOs), deliver fixed wireless access, and operate as an alternative to distributed antenna systems (DAS) and Wi-Fi.*





How CBRS impacts Private Wireless (Cellular) Networks

Although the large-scale adoption of CBRS is picking up steam, the market is still maturing and standardizing use cases for the sizable 150 MHz band. **Spectrum availability is a critical component of the success and maturation of the private cellular market in the U.S.** as enterprise businesses seek out a Wireless WAN solution that checks all the boxes of security, scalability, coverage, latency, and speed.

Whether an organization has already purchased a license to use the CBRS spectrum or they plan to use **G**eneral **A**uthorized **A**ccess (GAA), converting their allotted spectrum to a Private LTE model can solve a myriad of operational hurdles by:

- Alleviating severe network congestion through priority and preemption.
- Providing secure, mobile, interference-free connectivity.
- Facilitating the storage and management of sensitive data at the edge.
- Delivering Wireless WAN & LAN solutions where carriers lack infrastructure.
- Making high-bandwidth applications more affordable.

CBRS use cases

Industries throughout the U.S. have taken note of Private Wireless/Cellular Network (PWN) benefits, and CBRS availability only further increases the likelihood that organizations & businesses can take advantage of next-generation technologies where connectivity is required. Here are a few ways Private Wireless/ Cellular and CBRS are being used today:

Connected equipment and autonomy

Across vast landscapes and hard-to-reach places, Private Wireless/Cellular Network (PWN) provide businesses with a means to get the job done. For example, the mining industry uses Private 5G and LTE to operate remote-controlled vehicles in dangerous environments, while agricultural enterprises use PWN to connect soil sensors and digital nutrient maps that guide irrigation practices, pruning, and chemical applications.

Asset modernization

A PWN can securely connect devices used for remote monitoring and control, such as intelligent traffic sensors driving automation and improving efficiencies. In addition to connecting their point-of-sale operations and 4K video displays, large retail complexes like American Dream have used CBRS and Private LTE to implement location tracking sensors for strollers and elevators, ticketing machines, and more while saving nearly 90% of fiber optic costs.

What is LTE?

The acronym "LTE" stands for "Long Term Evolution." **LTE is a 4G wireless broadband standard**. It's the second most advanced option available for mobile data connectivity, only to 5G. Therefore, if you have a phone and a plan with 4G LTE capabilities, you'll be receiving some of the fastest data speeds that are widely available (high-band 5G is only available in a handful of cities).

LTE technology offers faster data connection and lower latency. Additionally, LTE lets more phones connect to the same network at one time. This means that areas with higher traffic such as a concert or sporting event won't be affected as much as they would with older cellular technology.

Why WiFi usually does not work.

Challenges of Wi-Fi in large areas …

In an office, store, or vehicle, Wi-Fi enabled by access points and other network hardware is an excellent tool for connecting a multitude of devices. However, for organizations that oversee ***operations across vast, sprawling areas and/or rapidly changing spaces, Wi-Fi is challenging, if not untenable***. Private Wireless/Cellular Networks can help companies address the problems associated with using Wi-Fi as Wireless LAN.

Costs

Many large facilities, campuses, downtown areas, and other spaces now are equipped with an array of IoT devices — all of which require connectivity. Unfortunately, ***laying fiber in the ground and installing a huge quantity of Wi-Fi access points is exceptionally expensive***. Outfitting just one large site could cost many millions of dollars for the fiber alone.

The infrastructure needed for PWN is far less expensive than a widespread Wi-Fi deployment, which requires extensive wired line installation. Also, whereas dozens of Wi-Fi access points would be required in a big area, a LAN based on cellular broadband would call for just a few PWN radios.

WiFi and it's lack of Performance and reliability

Even if an organization can afford to bear the cost of widespread Wi-Fi throughout a large area, limitations regarding performance and reliability likely will derail success. **Wi-Fi isn't sufficiently stable or robust** — without significant cost — to support the types of high-bandwidth applications that are becoming more standard in most business operations situations, especially across vast areas. Examples include wireless robotic devices and real-time video surveillance streaming.

One of the reasons for Wi-Fi's deficiency is that the client — such as an IoT device, computer, or phone — decides when to roam from one AP to another (sometimes with the help of the AP), but with virtually no ability to improve performance when it lags. With PWN, the organization itself controls its connections. Through priority and preemption, the *PWN network equipment can provide better Quality-of-Service (QoS) to designated SIMs and devices.*

Security

Wi-Fi security is limited to a username and password, which may be acceptable for logging in at a coffee shop but is concerning within the framework of a large organization's corporate network. **When various types of sensitive data and IoT devices are at stake, additional layers of security are necessary**.

LTE deployments include SIM cards and edge networking devices, providing additional layers of security that aren't possible with Wi-Fi. A PIN can also be required to unlock a SIM inside a router. This is a form of two-factor security for the edge device.

Network architecture with Private LTE usually includes on-site servers, enabling organizations to **keep traffic between IoT devices and corporate servers on the Wireless LAN instead of the public Internet**.

Altogether, these factors give Private LTE inherent security advantages over Wi-Fi and help protect an organization's most critical information from malicious attacks.

Private Wireless/Cellular Networks eliminates these potential obstacles of public cellular across broad areas, providing several key benefits:

- **Infrastructure:** Private LTE and 5G can be deployed rather easily in locations where public LTE isn't available.
- **Costs:** Keeping high-bandwidth content on-site with PWN and local servers reduces costs in situations when that content doesn't need to leave the area. Also, **using CBRS eliminates the need for recurring fixed-rate cellular data costs**. Even in scenarios where MSPs are used for private cellular, flat-rate plans likely will drive down costs.
- **Latency:** The ability to avoid sending high-bandwidth information off-site minimizes latency.
- **Security:** Whenever possible, most enterprises prefer the **extra level of security** afforded by keeping data local instead of sending it elsewhere.
- **Congestion:** Putting an organization's network on a different frequency alleviates the need to compete for coverage against nearby users. Additionally, priority and pre-emption can be activated for control over how traffic is prioritized — **a level of Quality of Service (QoS) that isn't possible through public cellular networks.**

When and how organizations use Private Wireless/Cellular

The benefits of Private LTE are piquing interest in virtually every industry where organizations have large areas filled with lots of devices and applications that absolutely must be connected at all times — and where sensitive data must be gathered and then shared between devices and servers. When Wi-Fi and even public LTE aren't possible or even ideal, PWN fills needs in several key use cases:

Vast areas with complex networking needs

In large spaces with extensive network requirements and hundreds of users and devices, PWN helps prevent the congestion likely with Wi-Fi and public cellular and is much less expensive to provision and maintain.

High-risk information

In some scenarios, highly sensitive information that is very valuable to hackers is unavoidable. Organizations such as *hospitals can keep important information on-site via Private LTE*, enabling additional layers of security unavailable through Wi-Fi.

High-bandwidth traffic within budgetary limitations

Organizations looking to connect many video surveillance cameras could use public LTE, but data usage likely would be cost- prohibitive. Fixed-rate private cellular is a much more cost-effective option.

Remote locations lacking wireless infrastructure

In the middle of nowhere-in places where carriers have not set up wireless infrastructure-organizations can relatively easily set up a Wireless LAN via private cellular.

Given the ubiquity of IoT and connectivity-dependent technologies, Private LTE is becoming very applicable in most industries. The ability to set up a Wireless LAN that is much more high-performing, reliable, flexible, cost-effective, and secure than a Wi-Fi network meets the specific needs found in many use cases.

Real-world uses for Private Wireless/Cellular Networks:

We connect people to what matters most…

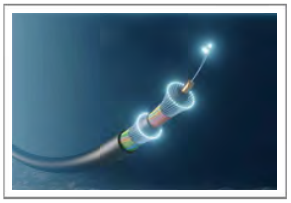
PNe leverages *technology solutions to provide connectivity - for you and your community* in the areas of:

2.5 **Vertical Assets - Towers & Buildings** is also one of the most three (3) critical components necessary to be able to plan, design, engineer and deploy a Wireless Netwo for any organization or business.

Location, height and proximity to access, fiber and electricity are all components that determine if a Vertical Asset will be a candidate for consideration of the wireless network. Towers, roof-tops, water-tanks and utility & light poles have all been used as Vertical Assets.

This Preliminary Wireless Broadband Network assessment design utilizes 36 strategically located, 300 foot towers that are in close proximity to the Lit fiber design to be able to provide service for 36,000 users.

2.6 **Fiber Assets -** are one of the most three (3) critical components necessary to be able to plan, design, engineer and deploy a Wireless Network for any organization or business. Fiber is what allows the new wireless network equipment to function - because the equipment needs information to travel at the speed of light.



3.1 **Wireless Spectrum Available** we utilized CBRS spectrum in our preliminary RF Design of a Fixed Wireless data network. If it is determined that a mobility & data network is desired - different design criteria may need to be considered.

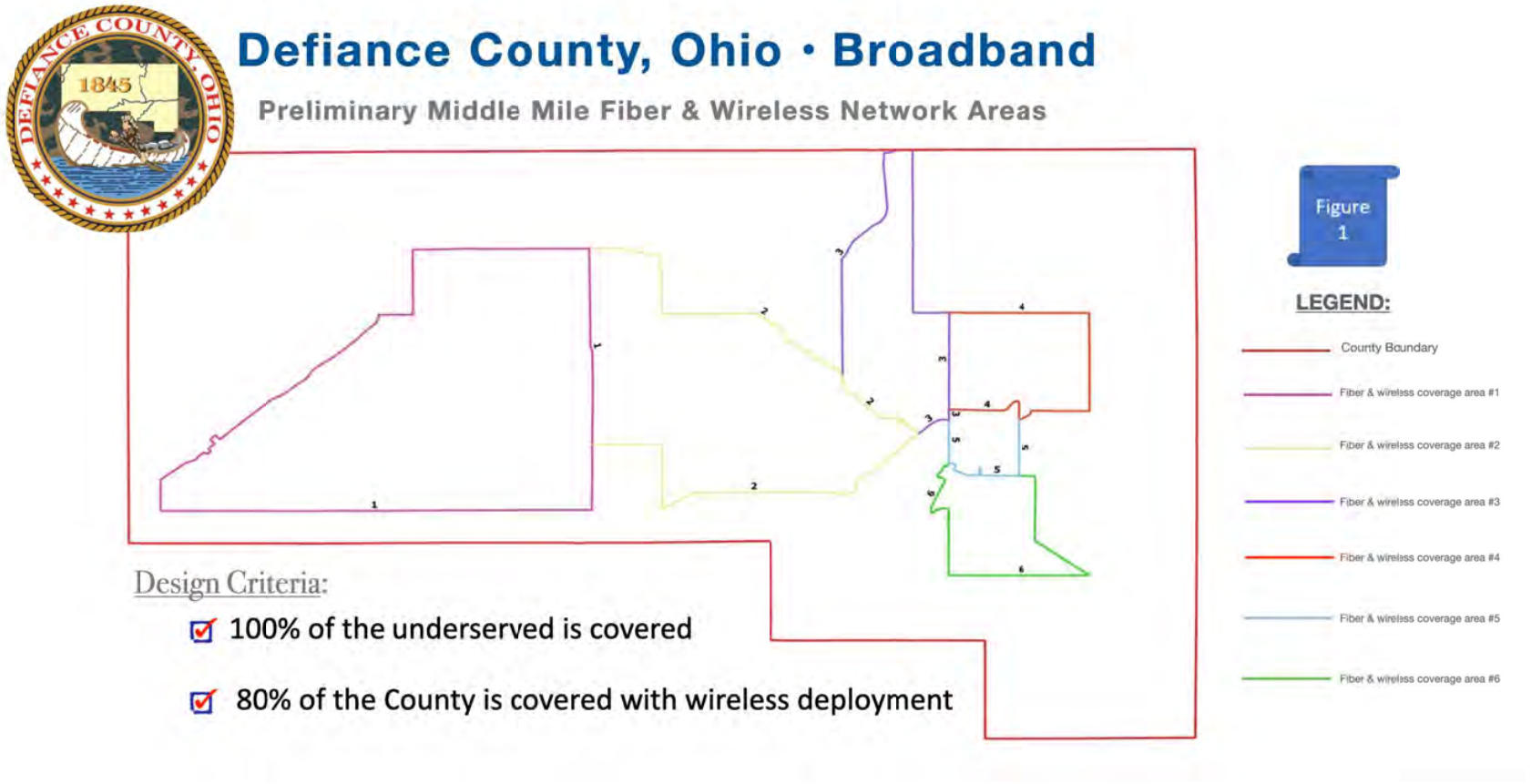
3.2 **Wireless Network (Fiber) back-haul Design and Engineering** we utilized Lit Communities fiber design in our preliminary RF Design of a Fixed Wireless data network. At a high level, towers are placed near last mile fiber for efficient, effective, and cost reduction access to fiber. If it is determined that a mobility & data network is desired - different design criteria may need to be considered.

3.3 **Radio Frequency (RF) Design and Engineering** preliminary RF Design of a Fixed Wireless data network utilized the following criteria:

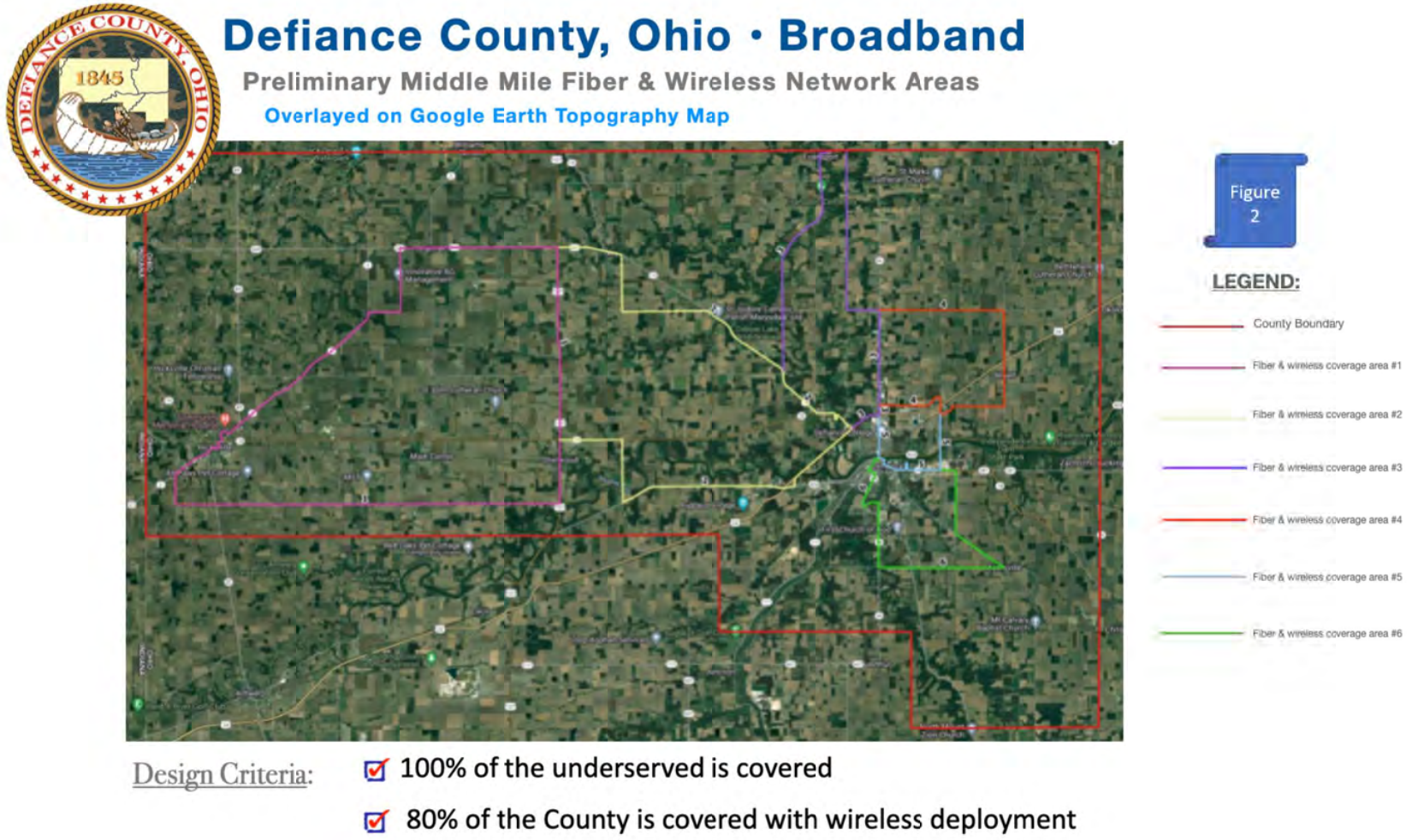
- ☑ 100% of the underserved is covered
- ☑ 80% of the County is covered with wireless deployment
- ☑ Physical network speeds 100 Mbps symmetrical to end client
- ☑ Towers are placed near last mile fiber for efficient, effective, and cost reduction access to fiber.
- ☑ 36 strategically located, 300 foot towers.

3.4 **Wireless Equipment Engineering** we utilized CBRS LTE capable equipment to model the preliminary RF Design of a Fixed Wireless data network. We also utilized the latest cutting edge equipment, Tarana, in our design & engineering.

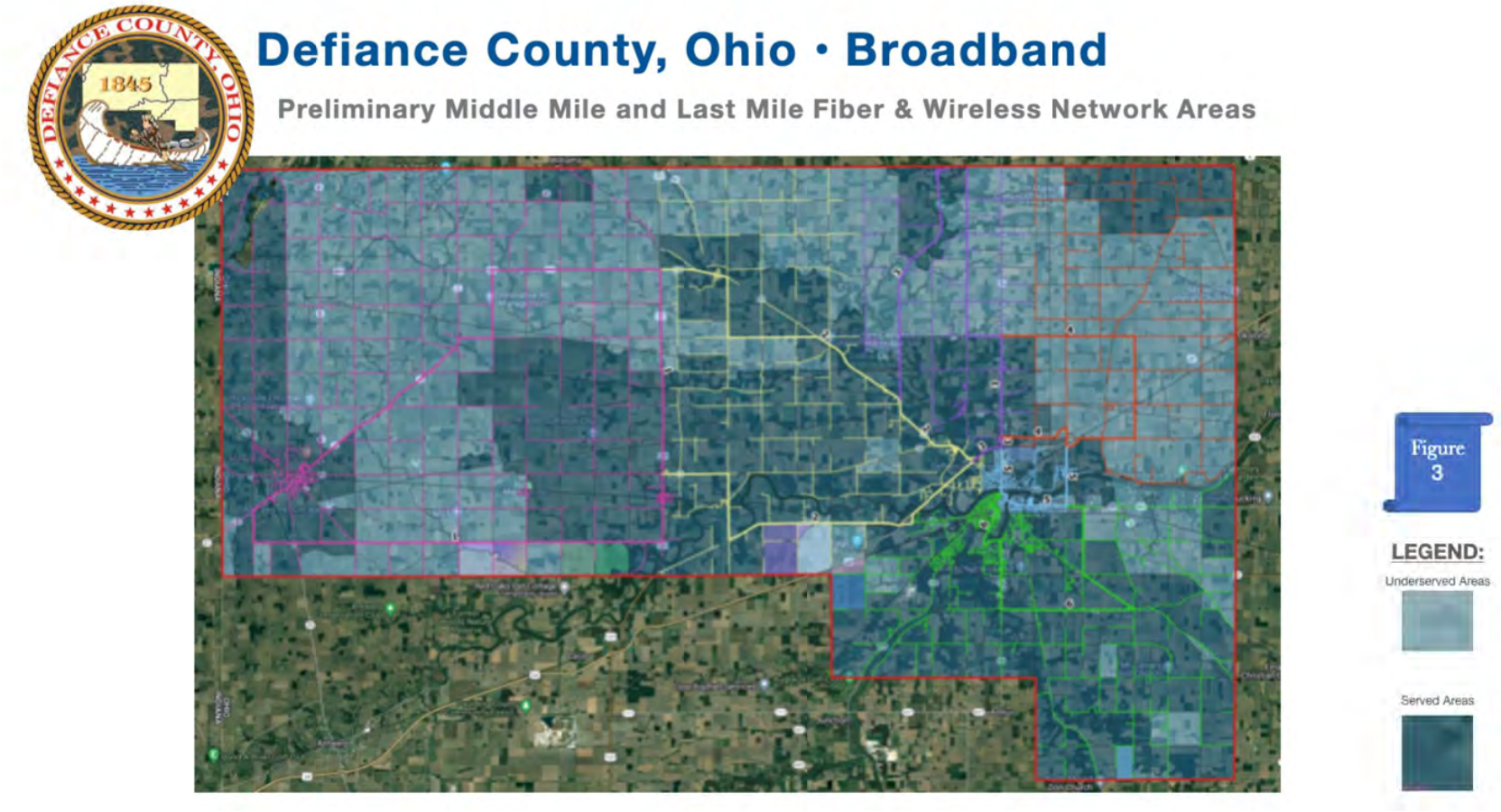
4 .1 County Boundary and Six (6) fiber rings



4 .2 County Boundary and Six (6) fiber rings - overlayed on Google Earth Topography Map



4 .3 Unserved & Served areas - with Middle & Last Mile fiber - Wireless Network Areas



4 .4 Reference Signals Received Power (RSRP) - Propagation Map

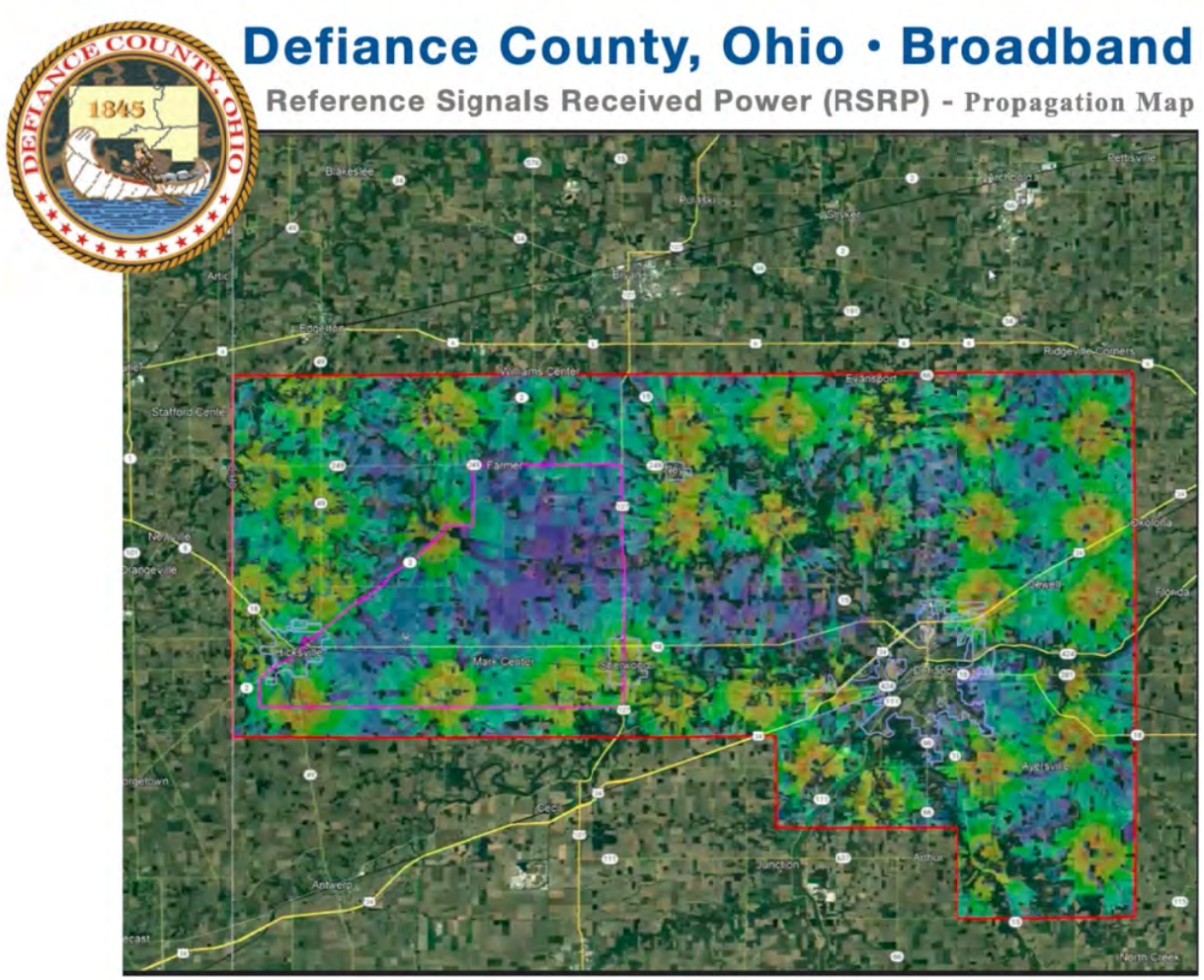


Figure 4

LEGEND:

RSRP

>= -70 dBm	Excellent
-74 to -70	
-78 to -74	
-82 to -78	Good
-86 to -82	
-90 to -86	
-94 to -90	
-98 to -94	Poor
-102 to -98	

4 .5 Best Server - color coded - Propagation Map

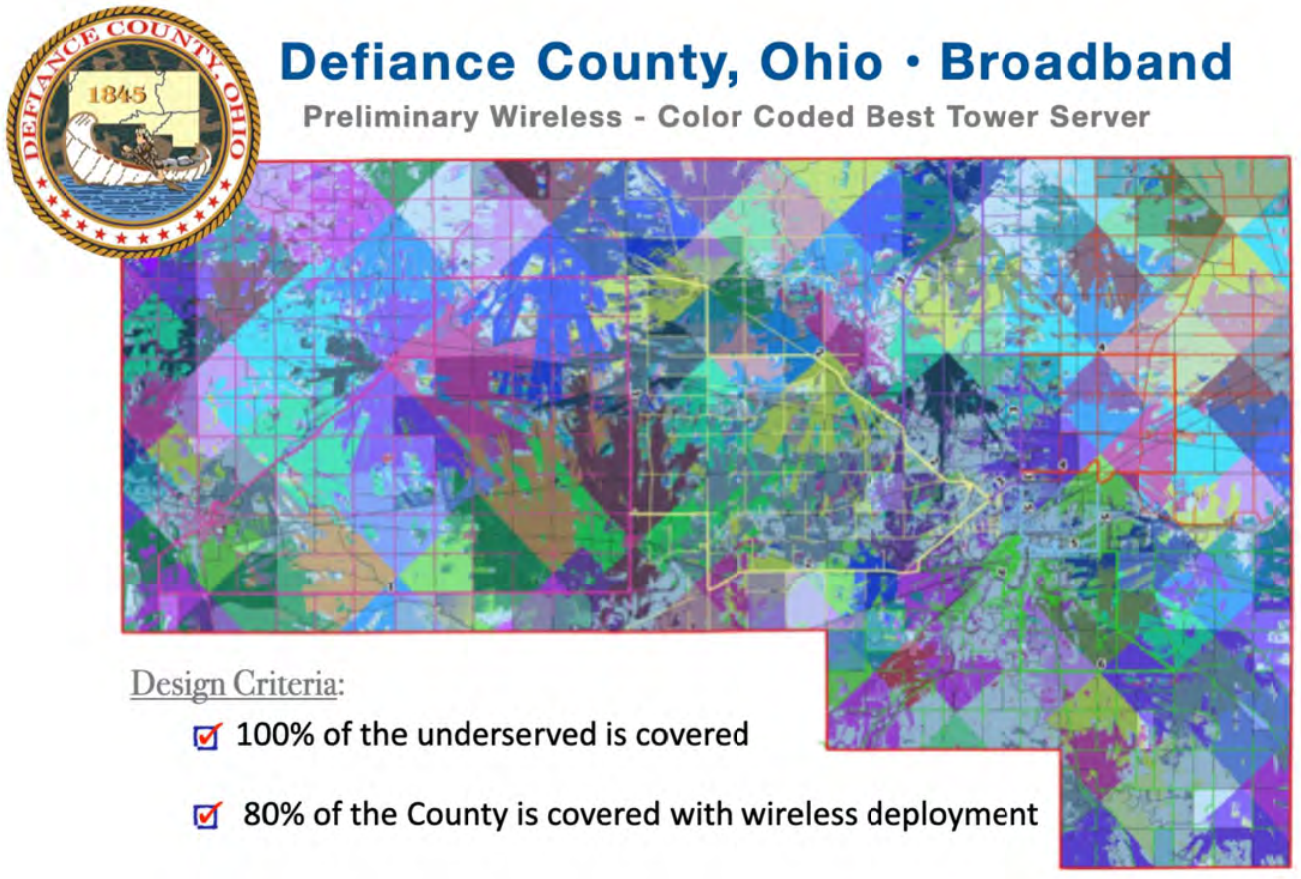


Figure 5

LEGEND:

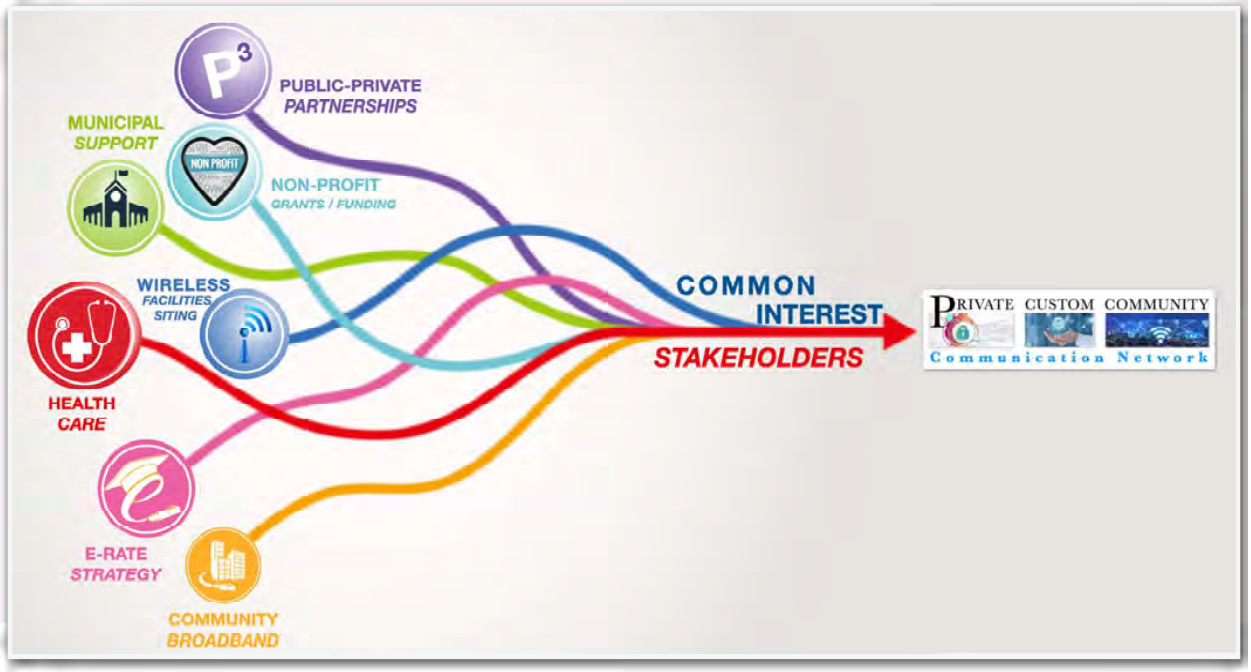
Each Radio Frequency (RF) sector is represented by a **different color** - to visually illustrate the sector that is best serving the geographic area.

The RF propagation map also illustrates that the design coverage objectives are being met.

5. Community Investment

5.1 Community Investment Opportunity overview

Communities considering enhancing Broadband service to underserved areas we encourage communities to consider stakeholders from all areas, industries and the federal, state and local possible participants and contributors. An illustration of that concept and strategy is shown below:



The Rural Digital Opportunity Fund (RDOF) reverse auction recently conducted by the FCC was designed to support deployment of broadband in many currently unserved parts of the country. However, RDOF awardees have years until they are required to build their networks, so unserved locations in RDOF-awarded areas may have a long wait until they receive service.

In addition, many RDOF awardees placed extremely low bids for the areas, in many cases, too low to build and operate a sustainable network. Therefore, many awardees may default on their obligations, or may need to scale back their commitments in service

area or performance. A fixed wireless network may provide connectivity sooner in RDOF-awarded areas while awardees address any problems in deployment.

Based on our analysis, **a fixed wireless solution using existing towers would provide service to 99.2 percent of all unserved locations in the case-study areas of the county.** If there is a lack of unassigned EBS channel blocks in Defiance County, they will be forced the use of CBRS and unlicensed 5 GHz only.

Based on our analysis, **a fixed wireless solution using new towers, at strategic locations, would provide service to 100 percent, of all unserved locations in the county. This preliminary assessment did not include determining if those locations are available. This approach will contribute to a higher capital estimate.** Strategies to reduce capital amounts are utilizing existing towers or structures of potential stakeholders.

The capital cost per location served varies based on the scale of the network. This is due to the cost of tower equipment, backhaul, and other fixed costs for the distribution network independent of the customer premises equipment (CPE) and installation. The distribution network includes the core equipment and backhaul and radio equipment, including antennas located on towers, poles, or other structures that distribute service to a CPE (customer premises equipment); the distribution cost per served premises ranges from averages approximately $570 across the County. This number does not include a CPE amount. We use the cost of a new tower between $300,000 and $420,000, depending on the terrain and height needed, including construction cost. Again a strategy to reduce capital amounts for towers, are to utilizing existing towers or structures.

Our design and resulting estimates only consider the use of new towers and we assumed that space, at the needed height on each would be available. We assumed that backhaul is provided by fiber optic cabling provided by Lit Communities. Capital costs also include engineering and design, RF path analysis, structural analysis, site acquisition, and permitting.

One way to reduce Capital amounts for the network equipment is to share the cost of the network core among adjacent or nearby stakeholders. Core network costs have been included in the cost for our design recommendation.

Fixed Wireless Network Deployment Cost Factors

Fixed wireless network deployment costs depend on a range of factors including the following:

- **Wireless equipment used.** Spectrum selected, required capacity, and required coverage range for a solution defines what equipment will be required. Access point (tower) equipment costs for EBS, CBRS and 5 GHz are relatively similar, approximately $5,500 to $6,000 per installation. Using 10 MHz of bandwidth, an access point can potentially support up to 64 locations for CBRS, EBS, or 5 GHz unlicensed spectrum.

- **Backhaul connection**. This is the connection between two towers via a point-to-point wireless microwave link or a fiber connection between the wireless equipment on the tower and core network. If a wireless backhaul connection is required, equipment is estimated to cost close to $15,000. Ongoing, operating expenses for this equipment includes maintenance and replacement fees. Fiber connection costs vary as to whether or not fiber is close to the access point and, if fiber will need to be built to the access point, the length of fiber installed. The cost to build fiber ranges from $25,000 to $150,000 per mile, depending on installation method, terrain, and other factors. If fiber is available, there may be an ongoing lease cost to use the fiber to connect to the core.

- **Future capacity and lifespan of investment.** Wireless equipment generally requires replacement every five to ten years—exposure to the elements causes deterioration and technology continues to advance at a rapid pace, making older equipment obsolete.

- **Placement on towers.** Fixed wireless networks work best when the line of sight between tower and subscriber antennas is optimized. Therefore, space near the top of a tower is most desirable, and therefore potentially more expensive, to minimize obstruction and reach the maximum number of premises. Cluttered and hilly areas will require higher antenna placement and potentially the need for additional towers.

Capital Costs

Capital cost trends are consistent with the number of locations served. This is due both the cost of towers and the cost of the CPE for each location. PNe analyzed the costs in each of the unserved locations. Our analysis makes the following assumptions:

- All served locations require subscriber equipment—either an indoor or an outdoor CPE.
  - Outdoor CPE cost approximately $1,000, including equipment and installation.
  - Indoor CPE cost approximately $500 (less than outdoor CPE because no outdoor antennas are installed) and are used where possible to reduce costs.
- Service will be used by 60 percent of the served locations.
- Towers will be configured with at least three sectors for each frequency used.
- EBS spectrum, if available and obtainable, would be our preference to utilize where sufficient spectrum is unallocated. CBRS is the primary spectrum recommended where insufficient EBS spectrum is available. Additional frequencies and equipment (CBRS and 5 GHz) would be added if necessary to provide additional capacity where justified by the number of locations in the coverage area.
- Backhaul is provided by fiber optic cabling where it already exists and /or is planned, microwave links otherwise. We assume that 100 percent of the sites planned sites would utilize Lit Communities fiber.
- Engineering and design costs include propagation studies, RF path analysis for point-to- point connections, structural analysis, construction plans, and permits. This cost is estimated to be 15 percent of the distribution network cost.
- Site acquisition costs include preliminary equipment dimensioning, power needs, shelter requirements, RF suitability, escorts, lease negotiations, and permitting. Actual costs will vary, but the average is approximately $25,000.
- Estimates includes core network equipment for each solution to manage functions such as authentication, billing, security, and connection to the internet. We estimate $300,000 for equipment and setup of the core network equipment.

Operating Costs

Operating costs are not included in this preliminary assessment. They will vary across the county based on the number of towers required and the number of locations or student locations predicted to be served by the analysis model, primarily the number of locations served. The more locations served, the lower the annual operating cost per location.

If we are asked to estimate operating cost, in a future assessment phase, our estimates would consider maintenance and equipment replacement for the distribution equipment at the tower sites and core. Regular maintenance includes any adds, moves, and changes required. Electronics may need to be replaced at 5-10 year intervals due both to technological obsolescence and wear and tear—and unlike a fiber network, the electronics comprise almost all of the capital cost of the network, thus significantly increasing the operational cost as a fraction of the total cost of operations.

Our "Operating & Maintenance Model" would also consider customer premise equipment (CPE) replacement at 10 years, amortizing the cost annually. In each county's unserved and unserved student areas, the cost of the distribution network (the antenna sites and the supporting network) ranges from $325 to $1,950 per location (assuming a 60 percent adoption rate). The installation cost of CPE per subscriber, including labor, materials, and electronics is approximately, on average, $840 per location.

Current supply chain challenges for all areas, need to be considered relative to the time frame of the estimate and delivery times and recognize the possibility of cost increases or wait time on deployment based on availability.

There may also be costs or fees associated with spectrum licensing or auction bids. The EBS auction have occurred, therefore no actual auction bids are available, and EBS spectrum would need to be secured from a willing owner - interested in selling or leasing their spectrum. For the sake of our analysis, we did not include any EBS purchase pricing. As for our coverage analysis, our operating cost estimates would assume only the use of CBRS GAA or unlicensed spectrum and therefore no costs were associated with CBRS spectrum usage.

Consideration would also need to be given for staffing to operate the network including program and network management, network technician and technician training, help

desk/customer service, portal/application/access management, general counsel, and some business administration roles for billing and other duties. Staffing requirements will need to be scaled for each of the county areas based on the number of estimated towers and users. The model will also need to include insurance and minimal office expenses.

Most of the operating costs will be due to tower space leasing and fiber back-haul cost. Operating cost estimates will be greatly affected by ownership or leasing of infrastructure assets.

Of note, if a new tower is installed to provide service to more users, permitting for new tower locations may require a public hearing process and may require months, and may be difficult to achieve if there is local opposition to the tower.

We generated coverage propagation maps and capacity estimates, such that the signal levels would achieve a throughput of 100 Mbps download and 100 Mbps upload for each of the frequencies used. For all the three bands, CBRS, EBS and 5 GHz, the coverage maps indicate the coverage area where throughputs of 100 Mbps download and 100 Mbps upload could be achieved at the cell edge.

The CBRS and 5 GHz unlicensed models assume that equipment runs at the full power allowed by the FCC limits.

Indoor vs. Outdoor Customer Premises Equipment (CPE)

There are two main ways to provision fixed wireless service at an location:

- Install an outdoor antenna and CPE on the roof or elsewhere on the property
- Provide a signal using an indoor CPE. Using an indoor CPE is cheaper and reduces the time and complexity of installation. Where possible service should be provided using an indoor CPE utilizing a wireless gateway device that distributes the signal within the location using Wi-Fi.

Our model does not estimat which locations could be served with an indoor CPE and which ones would need to have an outdoor antenna installed on the roof of the home. We created coverage maps of indoor versus outdoor coverage analysis for the majority of the county. But our coverage predictions are based on our RF tools and we do not have any actual testing at these locations at the time of this project. To serve users indoors, stronger

signal levels are needed. Therefore, some locations may not be able to be served indoors, especially those further away from the base station.

Indoor CPEs are more feasible for EBS than for the other frequencies, due to the allowance for higher output power and the ability of the lower frequency to penetrate walls.

The need for outdoor CPEs has the net effect of increasing the network costs for the non-EBS networks, because a higher percentage of the homes will need the costlier outdoor installation.

Below are details of the Capital Requirements for all of Definance County, Ohio and again do not include any CPE cost. One reason for not including CPE cost, is because we have seen in certain projects that cost is covered by a different stakeholder.

5.2 Capital Requirements Summary - for a Fixed Wireless Broadband CBRS LTE Network

This Capital Investment will provide for **36 New** 300 foot **towers**, and a **CBRS LTE wireless network** that will serve up to **36,000 users**.

5.2 Capital Requirements Details - for a Fixed Wireless Broadband CBRS LTE Network

WIRELESS CAPITAL DETAIL

Market	Defiance County, OH
Due Date	NA
Population	38,286
Median Household Income	$ 62,110
Median Age	40
Future FTTP Metrics	
Total Demand Points	36,000
Demand Points Per Mile	1,000
Total Miles	30
Mobility %	0%
Fixed Wireless Access (FWA) %	100%
Underground Mileage	15
Aerial Mileage	15
Core & CRAN	$3,600,000.00
RF & Network Design	$684,000.00
FWA	$12,960,000.00
Mobility	$0.00
Total CC Costs	$4,284,000.00
Total FM Costs	$12,960,000.00
Subtotal	$17,244,000.00
Total Engineering Costs	$2,586,600.00
Total Soft Costs	$689,760.00
Total Operational Carry	$1,379,520.00
Total Capital Needed	$21,899,880.00

6. Summation

PNe has provided a **Fixed Wireless Assessment** for Lit Communities and Defiance County, Ohio regarding **"Broadband Modeling and Engineering Feasibility Plans"** for all of their County.

PNe conducted a technical and cost analysis of fixed wireless broadband options to reach areas in Defiance County, Ohio unserved by broadband. We focused primarily on utilizing Citizens Broadband Radio Service (CBRS) in our design and engineering modeling, to deliver broadband performance.

PNe also relied on their personal experience in their deployment and operations of fixed wireless CBRS LTE networks.

Included is a short introduction to:

- **Wireless Network connectivity infrastructure**
- **CBRS Spectrum**

We have also captured the associated capital requirements, at high level, and the major factors that impact those requirements, in the rest of the report and summarized those requirements.

The total Capital Requirement of $21,899,880 includes:

- **36 New 300 foot towers**
- **CBRS LTE wireless network**
- **36,000 user(s) capacity**