

Funding Pennsylvania
Broadband Expansion:
Examining the BEAD
Program and Broadband
Mapping Initiatives

Prepared for the Pennsylvania Department
of Community and Economic Development

Zachary Sanna

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MP Advisor: Professor David Hoffman, Duke
University Sanford School of Public Policy

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Executive Summary

The COVID-19 pandemic laid bare the lack of broadband access for many individuals across the United States. As many schools and workplaces shifted to be remote, many individuals, particularly those from low-income and rural backgrounds, were left behind. Congress sought to address the persistent lack of reliable broadband access through creating the Broadband Equity, Access, and Deployment (BEAD) program within the American Infrastructure Investment and Jobs Act. Congress placed states at the center of the program, responsible for securing funding and distributing program subgrants to bidders eager to build a more robust American broadband infrastructure network.

This report seeks to examine the key provisions of the BEAD program and explain how the Pennsylvania Department of Community and Economic Development (PA DCED) and PA Broadband Authority can leverage their roles to most effectively secure and distribute BEAD funding. Because accurate broadband maps are at the heart of BEAD funding distribution, this report seeks to provide PA DCED with an understanding of the best available methods to construct an accurate and actionable broadband availability and speed map. This report also offers suggestions for stakeholder engagement strategies, another key aspect of the BEAD program.

The broadband map, when constructed, will provide PA policymakers with much needed insight into the current state of broadband access in PA. The map can then be used to accurately direct the BEAD funding PA will receive. This project aims only to highlight the data, inputs, and policy prescriptions needed to construct accurate maps—not to construct a final broadband map for the state. The policy question guiding my approach is: *What methodology should the Pennsylvania Department of Community and Economic Development use for addressing shortcomings in currently available broadband access data?*

Firstly, I will conduct a legislative and content analysis of the BEAD program and the ongoing FCC broadband mapping initiative. I provide PA DCED with an overview of the relevant provisions, timelines, and funding guidelines within both programs. I also highlight the benefits and drawbacks of the FCC's ongoing approach to broadband mapping and how PA might want to address the potential drawbacks going forward.

To construct an accurate methodology for potential map construction, as well as potential stakeholder engagement strategies, I utilize a case study methodology. Through my selected case studies of the Penn State Extension and Southwester PA Planning Commission's broadband maps, Maine and Virginia's broadband authority policies, Georgia and US Telecom's efforts to construct an accurate location fabric, and the Netherlands Digitization Strategy, I highlight examples of exemplary work done to construct broadband access maps and improve broadband deployment initiatives inside and outside of PA. My analysis is split into three distinct but interrelated categories: 1) Efforts to map unserved areas; 2) Efforts to map underserved areas; and 3) stakeholder engagement strategies. I analyze the efforts of states and organizations and develop a list of strengths and weaknesses to their approach. I then utilize the lessons learned to inform six policy recommendations for PA policymakers:

1. PA DCED and the PA Broadband Authority should begin to gather the information that will be needed to submit a Letter of Intent to the NTIA to participate in the BEAD program and generate a 5-year action plan to access planning funds
2. PA DCED and the PA Broadband Authority should develop a comprehensive plan to engage relevant stakeholders
3. PA DCED should build a broadband map showcasing accurate broadband speeds across the state using speed test data
4. PA DCED should consider developing a location fabric-based broadband map and explore vendor options
5. PA DCED and the PA Broadband Authority should consider future scalability when awarding subgrants
6. PA lawmakers should consider amending or repealing 66 Pa. Cons. Stat. Ann. § 3014(h)

Throughout the report, the importance of four common themes emerges: 1) data accuracy and granularity; 2) stakeholder engagement; 3) Equity in cost and access; and 4) project scalability. This report, and the recommendations listed above, are designed to address these themes. By utilizing this report, I believe PA DCED can put itself at the forefront of state BEAD administration efforts and in a position to maximize the amount and utility of BEAD funding it receives.

I. Client and Policy Question

This report has been prepared for the Pennsylvania Department of Community and Economic Development (DCED). The PA DCED is largely responsible for encouraging broadband development in Pennsylvania. Because of the Infrastructure Investment and Jobs Act (IIJA), passed by the US Congress in October 2021, Pennsylvania expects to receive a windfall of at least \$100 million explicitly earmarked for broadband development.¹ In addition to the guaranteed \$100 million, states will be allocated additional grant money based on their share of unserved locations. This money will be directly tied to data, primarily in the form of maps, that demonstrates both broadband accessibility and megabyte per second (Mbps) download and upload speeds.

To improve broadband expansion efforts in the state, the PA legislature recently created the Pennsylvania Broadband Development Authority, which will be comprised of several cabinet-level Secretaries and selected members of the legislature, and be largely responsible for distributing IIJA funds.² My client team at the PA DCED will continue to support broadband development within PA and will work in collaboration with the Broadband Development Authority to identify where and how to direct funds.

PA is a large, mountainous state with many rural areas, making it difficult to get an accurate, granular picture of address-level broadband availability and Mbps download speeds. This in turn makes it difficult to know where and how to direct funds to improve broadband speeds. The PA DCED is looking to develop a more accurate picture of which counties and households may need targeted aid and what methodology should be used to create a map, database, and strategy that demonstrates those needs and effectively allocate BEAD funding.

Policy Question: What methodology should the Pennsylvania Department of Community and Economic Development use for addressing shortcomings in currently available broadband access data?

II. Issue Background

American Infrastructure Investment and Jobs Act- State Fund Allocation

The IIJA is the most significant investment in broadband infrastructure in American history. The IIJA was designed to address issues with American infrastructure, broadly. The bill includes funding provisions for improving roads, bridges, climate sustainability, and cybersecurity preparedness, among other areas.³ Among the bill's largest beneficiaries is high-speed broadband development. The bill allocates over \$60 billion towards improving US broadband infrastructure. American broadband penetration is currently considered to be underdeveloped by many experts.⁴ Importantly, the IIJA signals a departure from previous federal broadband expansion efforts in which the FCC was ultimately responsible for distributing funds.⁵

In its place, Congress created the "Broadband Equity, Access, and Deployment (BEAD)" program within the IIJA. BEAD funding, at \$42.5 billion, constitutes the lion's share of broadband funding within the IIJA. BEAD was created following controversy over the FCC's previous efforts at broadband development, which was marred by a botched grant allocation process and stalled broadband development progress.⁶ Instead, BEAD designates the National Telecommunications and Information Administration (NTIA) within the Department of Commerce as the federal lead for administering the BEAD program and developing funding guidelines. Though the NTIA is quarterbacking the BEAD program at the federal level, states are

squarely at the center of the program. States will generate a five-year broadband development plan, identify statewide broadband needs, and ultimately decide where funds are directed.⁷

BEAD Funding Details and Timeline

BEAD administration and funding guidelines are divided into two distinct “trigger” dates. The first of these dates is scheduled to occur by May 22, 2022, within 180 days of the passage of the IIJA.⁸ By May 22nd, the NTIA must release a notice of funding availability (NOFA). States must respond to the NOFA by providing a Letter of Intent (LOI) indicating their intention to participate in the BEAD program.⁹ The required contents of the LOI have not been published yet by the NTIA but will be published by May 22nd. According to the NTIA, some info likely to be required with LOI submission is:

- Details of the existing broadband program or office of the eligible entity, including current activities of the program or office
- Prior awards: the number of rounds of broadband deployment grants that the eligible entity has been awarded (if applicable)
- Existing plans & goals: Whether there is an eligible entity-wide plan and goal for availability of broadband (and relevant deadlines)
- Other funding: the amount of funding that the eligible entity has available for broadband deployment or other broadband-related activities (including data collection and local planning), and the sources of that funding (including whether the funds are from the eligible entity or from the Federal Government under the American Rescue Plan Act of 2021)
- Details on the number of full-time and part-time employees of the eligible entity who will assist in administering funds and the duties assigned to those employees, as well as details of relevant contracted support

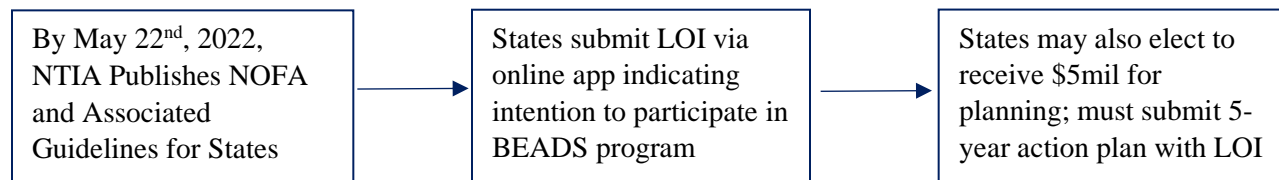
- Details of the goals of the eligible entity for the use of funds, the process that the eligible entity will use to distribute to subgrantees, the timeline for awarding subgrants, and oversight and reporting requirements that the eligible entity will impose on subgrantees
- The identification of known barriers or challenges to developing and administering grants received under the Program
- The identification of the additional capacity needed by the eligible entity to implement the requirements, such as:
 - Enhancing the capacity of the broadband program/office by receiving technical assistance from Federal entities/other partners
 - Hiring additional employees, or obtaining support from contracted entities; or
 - Acquiring additional programmatic information or data, such as through surveys or asset inventories
- An explanation of how the capacity needs described above were identified & how funds may be used to address those needs (including target areas)
- Details of any relevant partners, such as organizations that may inform broadband deployment and adoption planning
- Any other information determined relevant by the Assistant Secretary [Alan Davidson]¹⁰

Following the May 22nd NOFA, states may also elect to request up to \$5 million dollars of funding (representing 5% of first \$100 million of funding guaranteed to every state) for planning purposes. Planning purposes may include the need to collect relevant broadband access data, hire additional staff, and create access maps, among other potential uses.¹¹ States will need to indicate their intention to receive the planning-related funding by submitting a five-year action plan detailing their plans for broadband expansion.¹² The information required by the five-year plan has not yet been published yet but will be released by the May 22 deadline. The NTIA has offered some potential guidelines for states, indicating that the plan "...must be informed by collaboration with local and regional entities, and detail investment priorities, associated costs, and the alignment of planned spending with economic development, telehealth and other related

connectivity efforts.”¹³ According to the NTIA, additional guidance may include mandates designed to:

- Address local & regional needs for broadband service in the eligible entity
- Propose deployment solutions for affordable broadband service in the eligible entity
- Include localized data with respect to the deployment of broadband service in the eligible entity, including by identifying locations that should be prioritized for Federal support with respect to that deployment
- Ascertain how best to serve unserved locations in the eligible entity, whether through the establishment of cooperatives or public-private partnerships
- Identify the technical assistance needed to carry out the plan
- Assess the amount of time it would take to build out universal broadband service in the eligible entity¹⁴

Figure 1: First “Trigger” Timeline



Source: New York Law School Advanced Communications Law and Policy Institute/NTIA

The second key “trigger date” is directly tied to the release of updated FCC broadband availability maps. Shortly after the release of the FCC’s broadband maps, the NTIA will calculate the funding allotted to each state. Funding will be split into three buckets:

1. 10% of total BEADs funds (around \$4 billion) will be immediately allocated to states based on their share of unserved high-cost areas in the US. “High-cost” refers to areas where the cost of building out broadband is higher than in other unserved areas across the US. These funds will be mainly targeted at rural areas and areas with unique and difficult to access or navigate topography.

2. \$100 million automatically allocated to every state
3. The remaining funds (around \$32 billion) will be allocated to states based on their share of unserved locations relative to unserved locations across the US. For example, if PA has 5% of the total US share of unserved locations, it could roughly expect to receive an additional \$1.6 billion.¹⁵

After the NTIA notifies states of their BEAD funding allocation, states will be tasked with submitting an initial proposal on the NTIA's online portal detailing their planned use of the funds. The NTIA has indicated that initial proposals should do the following:

- Outline the long-term objectives of deploying broadband, closing the digital divide and enhancing economic growth & job creation, including, where applicable, information developed by the eligible entity as part of the 5-year action plan and information from any comparable strategic plan otherwise developed by the eligible entity
- Identify and outline steps to support local & regional broadband planning processes or other ongoing efforts to deploy broadband or close the digital divide, and subsequently describe coordination, both with local and regional planning processes and with local governments
- Identify existing efforts funded by the Federal government or a State within the jurisdiction of the eligible entity to deploy broadband and close the digital divide
- Include a plan to competitively award subgrants to ensure timely broadband deployment
- Identify each unserved and underserved location, and each eligible community anchor institution, within the jurisdiction of the eligible entity
- Certify eligible entity's intent to comply with all applicable requirements. Eligible entities must also meet local coordination requirements, as established by the Assistant Secretary¹⁶

The NTIA's initial proposal guidance highlights the importance of coordination with county and local government entities. Indeed, proof of coordination will be essential for gaining initial funding approval from the NTIA. The NTIA and Assistant Secretary Davidson are still working

on the exact guidelines for what will qualify as proof of “local coordination,” but the NTIA has defined what states will need to do to meet the bare minimum standards for local coordination:

- Provide an opportunity for political subdivisions of an eligible entity to submit plans for consideration by the eligible entity
- Provide an opportunity for political subdivisions of an eligible entity to comment on the initial and final proposals of the eligible entity before submission to the Assistant Secretary¹⁷

If a state’s initial proposal is approved, the NTIA will release 20% of available funding. During this time, the state must also open its initial plan to a challenge process. According to NTIA guidance, states will need to create a transparent process allowing “...a unit of local government, nonprofit organization, or other broadband service provider... challenge a determination made by the eligible entity in the initial proposal as to whether a particular location or community anchor institution within the jurisdiction of the eligible entity is eligible for the grant funds, including whether a particular location is unserved or underserved.”¹⁸ States are required to resolve all challenges 60 prior to dispersing grant funds.¹⁹

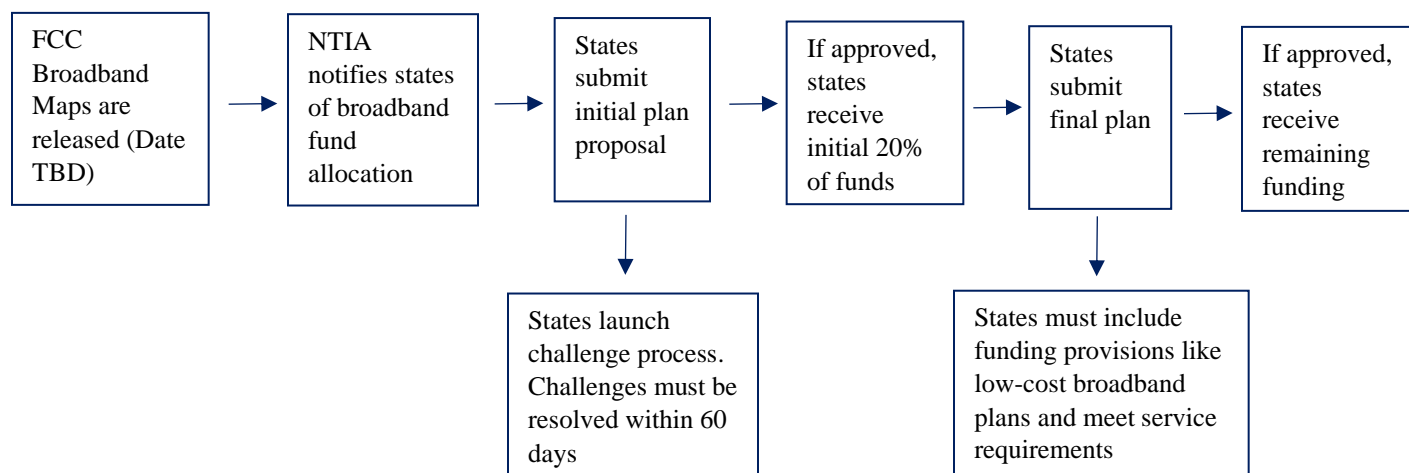
Following a successful initial proposal and challenge period, states are invited to submit a final proposal that will entitle them to receive their remaining BEAD funding. According to NTIA guidance, the final proposal should include:

- A detailed plan that specifies how the eligible entity will allocate grant funds for the deployment of broadband networks to unserved locations and underserved locations and align the grant funds allocated to the eligible entity, where practicable, with the use of other funds that the eligible entity receives from the Federal Government, a State, or a private entity for related purposes
- A timeline for implementation

- Processes for oversight and accountability to ensure proper use of the funds allocated to the eligible entity
- A description of coordination with local governments, along with local and regional broadband planning processes
- Meet local coordination requirements, as established by the Assistant Secretary
- To the greatest extent practical, align the use of grant funds proposed in the final proposal with funds available from other Federal programs that support broadband deployment and access²⁰

After the final proposal is accepted by the NTIA, the state’s remaining BEAD funds will be distributed.

Figure 2- Second “Trigger” Funding Timeline



Source: New York Law School Advanced Communications Law and Policy Institute/NTIA

In addition to the NTIA’s BEAD funding allocation process, the BEAD program provides guidance on how states should award subgrants. BEAD includes three priority funding provisions aimed at guiding state subgrant funding decisions. Note that priority considerations are listed in descending order, from highest to lowest priority:

1. Unserved service projects (80% of locations in the proposal area lack access to reliable 25 Mbps download speed/3 Mbps upload speed)
2. Underserved service projects (80% of locations in the proposal area lack access to reliable 100 Mbps download speed/20 Mbps upload speed)
3. Community anchor institutions (“CAIs”), such as schools, libraries, and hospitals, lacking access to 1 Gbps service²¹

All initial state subgrant funding derived from BEAD is expected to address the three funding provisions listed above, in descending order, before allocating funding towards other areas. For example, a state should only allocate subgrants to underserved areas *after* it has ensured that unserved areas have been sufficiently addressed by its subgrants.

The NTIA also defines several service and project requirements that must be met by subgrantees. The most important requirements are the following:

Project Service Requirements	Other Key Project Requirements
Provide service at a speed of no less than 100 Mbps downloads and 20 Mbps uploads	Required to offer at least one low-cost plan option to eligible subscribers (definition proposed by the eligible entity and approved by NTIA)
Provide service with a latency that is sufficiently low to allow reasonably foreseeable, real-time, interactive applications	Deploy the network and begin offering service within 4 years of receiving funds, unless meeting a specified exception
Provide service with network outages that do not exceed, on average, 48 hours over any 365-day period	Eligible entities must ensure that they or a subgrantee provide at least 25% matching contribution derived from non-Federal funds, except in high-cost areas or as otherwise provided by the Act
Provide access to each customer served by the project that desires broadband service	Any project that involves laying fiber optic cables or conduit underground or along a

	roadway, shall include interspersed conduit access points at regular and short intervals
Provide service compliant with cybersecurity and supply chain risk management practices, to be specified by NTIA	State subgrant programs cannot exclude cooperatives, nonprofit organizations, public-private partnerships, private companies, public or private utilities, public utility districts, or local governments
Priority broadband projects meet the above requirements, plus: <ul style="list-style-type: none"> • Meets the evolving connectivity needs of households and businesses • Supports the deployment of 5G, successor wireless technologies, and other advanced services 	Once network is deployed, must provide public notice, online and through other means, of that fact to the locations and areas to which broadband service was provided. In addition, carry out public awareness campaigns in service areas to highlight the value and benefits of broadband service to increase adoption

Source: NTIA/ Keller and Heckman Law Firm

Notably, the NTIA will be prioritizing cost and future scalability when evaluating state broadband proposals. Therefore, it will be important for PA to ensure that a number of its subgrants include plans to improve 5G wireless connectivity services, in addition to other potential future wireless and advanced technology services. PA should also prioritize projects with higher download/upload specifications than the required 100/20 Mbps standard. In practice, this will likely mean prioritizing projects that build out fiber-optic cable networks throughout high-cost areas in the state. Additionally, the PA Broadband Authority will need to carefully define what constitutes a “low-cost” broadband plan and closely scrutinize potential broadband plan affordability when evaluating subgrantee proposals.

BEAD program language prohibits states from excluding cooperatives, nonprofit organizations, public-private partnerships, private companies, public or private utilities, public utility districts, or local governments when awarding subgrantee contracts.²² This is particularly noteworthy for PA. 66 Pa. Cons. Stat. Ann. § 3014(h) of PA’s public utility code prohibits

municipalities from charging a fee for providing broadband services except in cases where private telecom providers have refused to provide service to the area.²³ While the NTIA generally has flexibility in defining BEAD program guidelines, the language of the local government non-discrimination clause was set by Congress within the IIJA's statutory language. While no specific guidance on this issue has been released yet, it is doubtful the NTIA will overlook or overrule statutory language within the IIJA to placate state law. This is likely to cause significant complications for PA when applying for BEAD funding if it chooses to willfully ignore subgrantee proposals from municipalities. Although early in the process, it seems likely that states' rights-related litigation centered on the local government non-discrimination clause will occur in the foreseeable future. This has the potential to at the very least delay BEAD funding allocation and is something for PA policymakers to keep a close eye on as the NTIA rolls out its funding guidelines in the coming months.

FCC Broadband Mapping- The Promise of Granular Maps

The most significant issue facing states looking to distribute IIJA funds is determining where funds should be directed. As outlined above, BEAD funding guidelines necessitate accurate and granular location-specific broadband availability and speed data. Unfortunately, states and the federal government have historically made funding decisions based upon largely unreliable broadband availability maps and data. Under past FCC rules, internet service providers (ISPs) were required to self-report areas where they provide broadband services. Unfortunately, past ISP reporting guidelines resulted in inaccurate data. According to a 2021 Government Accountability Office (GAO) report looking at ongoing FCC mapping efforts, the "FCC considers an entire census block to be served if a provider reports that it does, or could offer, service to at least one household in the census block."²⁴ This has historically resulted in

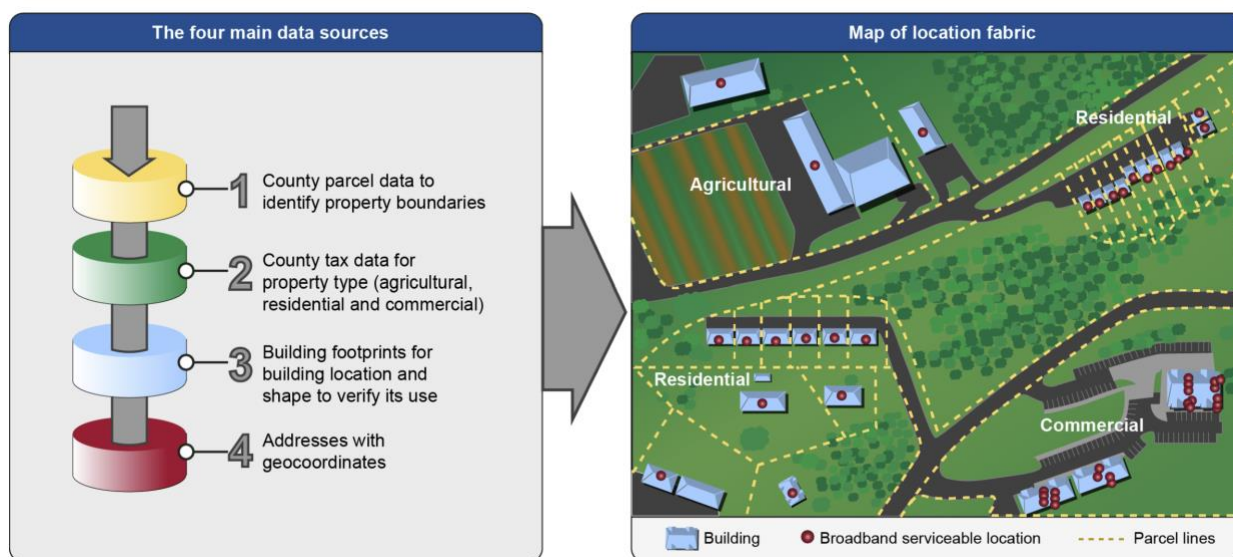
inaccurate mappings of broadband availability, particularly in rural areas where a single census block may encompass many miles of land. A 2018 study by the Center for Rural Pennsylvania is illustrative of the issues with existing FCC broadband data. According to FCC data at the time, 100 percent of Pennsylvania had broadband availability of at least 25/3 Mbps. However, researchers at the Center for Rural Pennsylvania found that *no* counties in PA had even half of their population meet the 25/3 Mbps standard cited by FCC data.²⁵

The deficiencies with FCC broadband maps led Congress to pass the Broadband DATA Act in 2020. The DATA Act requires the FCC to develop more reliable broadband mapping methods using more accurate and granular location fabric techniques.²⁶ Maps that utilize location fabrics amalgamate various types of location data to deliver an accurate picture of broadband availability.²⁷ Location fabric techniques rely upon layering various inputs to create accurate, address-level data that are able to differentiate between different types of buildings and indicate which structures are broadband serviceable. In its 2021 broadband mapping report, the GAO laid out the four types of data key to accurate location fabrics:

1. Address data- These data contain information typically associated with locating properties for the purpose of mail delivery or travel. In some jurisdictions, address data have been enhanced, producing “geocoded” address data... Geocoded address data are useful to locate specific residences and businesses and associate them with specific broadband serviceable locations... addresses must be geocoded using longitude and latitude information to be useful in location fabric development.
2. Parcel data- Parcel data identifies property boundaries associated with a particular property and are useful for determining which structures on a property may need or currently receive broadband service.
3. County property tax assessor data- These data contain information about the property taxes and use of a property, such as whether it is residential, agricultural, or commercial. Tax data can help verify broadband service needs or current access.

4. Building footprints- Building footprint data—or renderings of the base of building structures—involve imagery taken from orbiting satellites or aerial craft and may be useful in the location fabric development and validation process for determining what a building is based on its size and shape. Building footprints can help with specifying types of structures and identifying likely broadband access points on a property.²⁸

Figure 3: Location Fabric Data Inputs and Associated Location Fabric Map



Source: 2021 GAO Report: FCC Is Taking Steps to Accurately Map Locations That Lack Access

While generally regarded as the most accurate broadband availability data, location fabric data can be expensive to procure from private partners, who themselves may encounter difficulties securing some of the data required to develop an accurate location fabric. Creating a location fabric is a complex technical process requiring significant data science expertise. To create its location fabric, the FCC has contracted with broadband consulting firm CostQuest Associates (CQA). CQA, and other location data firms, procure necessary location fabric data from state, local and private sources to create a proprietary location fabric. CQA's FCC bid was the subject of a formal challenge by fellow location data firm Lightbox.²⁹ Following a monthslong GAO review, CQA's contract was approved, giving the company 120 days from

GAO's February 24, 2022, decision to release its first iteration of a comprehensive location fabric map.³⁰

While CQA will be developing a location fabric, ISP data remains essential to the development of accurate broadband maps. To assist in collecting this information from providers, the DATA Act requires ISPs to provide more granular data via updated FCC Form 477 disclosures. Whereas ISPs were previously allowed to consider a census block served if they were able to provide service to a single building within a census block, new reporting requirements mandate more granular, location specific data. New ISP reporting requirements released by the FCC on April 5, 2022, introduced a few new requirements. While ISPs are still able to submit subscriber data at the census block level via Form 477, they are now also required to submit broadband availability data via a separate web-based interface known as the Broadband Data Collection (BDC) system. Via the BDS system, ISPs are required to report data in one of two formats:

1. A list of locations served by the provider, in a tabular format, where the locations are based on the FCC's Broadband Serviceable Location Fabric. These must include a unique identifier, the geographic coordinates, and, where available, the address(es) associated with each location.

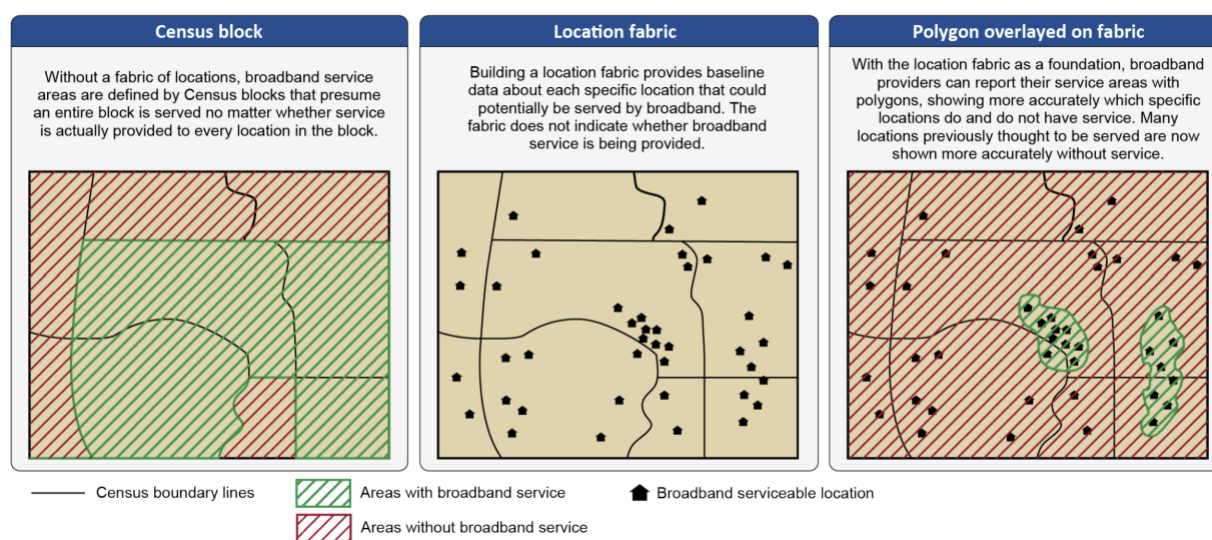
----- or -----

2. A polygon geometry and associated data attributes representing the availability of the provider's service in one of the acceptable GIS formats, including: ESRI Shapefile, ESRI FileGDB, GeoJSON, or Geopackage. "Polygons" refers to shapes whose outlines closely correspond to just the locations where their broadband is deployed in a specific area.³¹

The information required for the BDS system is a notable departure from the self-reported census block-level data previously required by the FCC. Perhaps most importantly, the new BDS system ensures a higher degree of accountability from ISPs. The information ISPs submit into

the BDS system will be overlaid with the location fabric developed by CQA and the FCC, resulting in a far more granular view of broadband availability across the US. With the location fabric serving as a baseline, ISP providers will submit their availability data in reference to the locations on the location fabric.³² **Figure 4** below illustrates how ISP data will be combined with the location fabric to create the broadband maps. According to new FCC guidance, ISPs will also be required to include the certification of a corporate officer and qualified engineer with their submissions.³³ ISP providers are required to submit their availability data by September 1, 2022, although the FCC has said that date could be pushed up depending on when the location fabric is completed.³⁴ FCC Chairwoman Jessica Rosenworcel announced during a March Congressional hearing that the new FCC maps are expected to be completed by fall 2022.³⁵

Figure 4: Mapping Broadband Serviceable Locations Using a Location Fabric



Source: 2021 GAO Report: FCC Is Taking Steps to Accurately Map Locations That Lack Access

Upon the release of the completed broadband maps, the FCC will initiate a challenge process for consumers and eligible entities like states, local governments, and nonprofit organizations. The FCC created a robust challenge process, likely recognizing the paramount importance of

getting the maps correct—100 percent of BEAD funding will be based on the FCC broadband maps, after all. In an order released in January 2021, the FCC outlined what information government entities must provide to begin the challenge process:

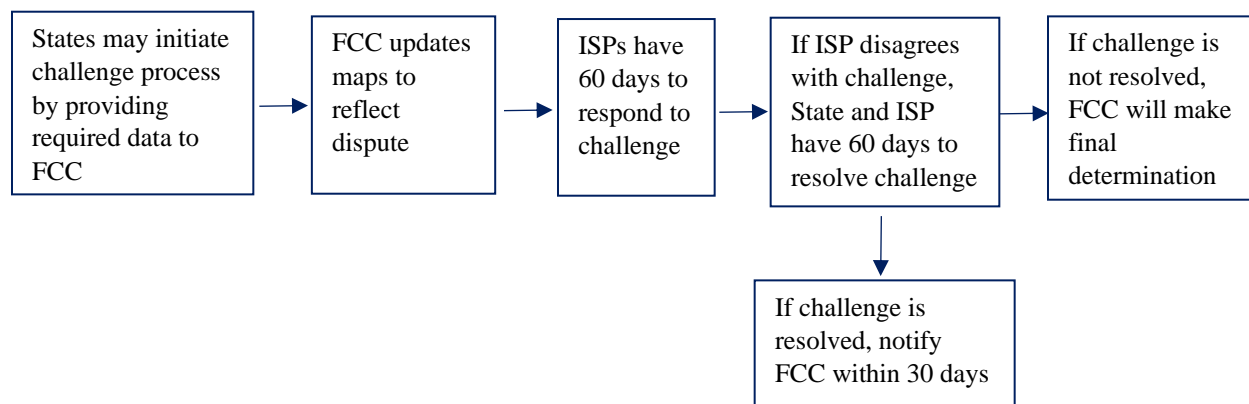
1. The name and contact information for the challenging entity
2. The geographic coordinates (latitude/longitude) or the street addresses of the locations at which coverage is disputed
3. The names of the providers whose data are being disputed
4. One or more categories of dispute, selected from preestablished options—e.g., no actual service offering at location, provider failed to install within ten business days of valid order for service, provider denied request for service, installations attempted but unsuccessful, reported speed not available for purchase
5. Evidence/details supporting dispute, including: (a) the challenger’s methodology, (b) factual and other basis for assertions underlying the challenge, and (c) communications with provider, if any, and outcome
6. A certification that the information submitted with the challenge is accurate, equivalent to the certification made by providers in submitting their availability data. For government and third-party challenges to Fabric data, we also require challengers to submit details and evidence about the disputed location.³⁶

Once a successful challenge is initiated, the FCC will update the public facing broadband map to show that the location(s) in question are in dispute by a government entity. The BDS system portal will then alert the relevant ISP that a challenge has been submitted against it, and providers will have 60 days to reply to the challenge.³⁷ If the ISP and government entity are able to resolve the challenge, they must notify the FCC within 30 days so that the map status can be updated.³⁸ In the event the ISP and government entity are unable to resolve a challenge, the FCC order states that:

...the provider must report the outcome of efforts to resolve the challenge in the online portal, after which the Commission will review the evidence and make a determination—with the burden on the provider to demonstrate service availability—either: (1) in favor of the challenger, in which case the provider must remove the location from its Digital Opportunity Data Collection polygon within 30 days of the decision; or (2) in favor of the provider, in which case the location will no longer be subject to the “in dispute/pending resolution” designation on the coverage maps. As with consumer challenges to coverage

data, a provider's failure to timely respond to a challenge will result in a finding for the challenger.³⁹

Figure 5: Government Challenge Process to Broadband Map Timeline



Source: FCC Third Report and Order on Modernizing the FCC Form 477

FCC Mapping- Potential Drawbacks to the FCC's New Approach

Although the new FCC broadband mapping effort shows significant promise, there are still several drawbacks for policymakers to consider. Most importantly, the accuracy of the map relies on an undeveloped and untested location fabric. Given the complexity of creating a nationwide location fabric, this should give pause to policymakers considering relying on the map to be accurate in its first iteration. In its 2021 report on the FCC's broadband mapping initiative, the GAO noted several potential complications to developing the maps. Firstly, the maps may suffer from a lack of completeness. To acquire the various types of data inputs needed for an accurate location fabric, CQA would likely need to secure tax records and parcel data from thousands of local governments across the US. These types of data are particularly hard to secure in rural and tribal areas, which are sure to be key parts of the "unserved" category.⁴⁰ Secondly, the accuracy of the secured data CQA may suffer due to the differing quality of data CQA will need to use to create the map. CQA will need to parse through various public records

to gather the necessary information needed to create an accurate location fabric. Because some municipalities do a better job than others at record keeping, there is likely to be some complications with compiling a complete, address-level dataset.⁴¹ For instance, some small government entities still keep paper records. Additionally, the GAO warns that some address data is not geocoded at all, making the data difficult to incorporate in the GIS-based map.⁴² Thirdly, the various data inputs will likely be inconsistent across sources. For example, the GAO report notes that there is no standard approach for geocoding addresses.⁴³ Additionally, the myriad government data sources are likely to code and link their records differently, requiring some complicated detective work for CQA. The issues with data completeness, accuracy, and consistency can likely be overcome, but will require a significant effort at standardizing data and combining data sources to make up for missing or incomplete data sets. Finally, the GAO notes that data privacy and disclosure laws may interfere with data collection efforts. For instance, address-level US Postal Service and Census data, two excellent potential sources of location data, are generally prohibited by federal law from being shared publicly.⁴⁴ Many state and local governments have similar public disclosure prohibitions. The FCC is trying to develop workarounds to these disclosure issues, but it is unclear whether CQA will be able to utilize these rich datasets when engineering its location fabric.⁴⁵

The most significant drawback to the FCC's new maps is that they continue to be reliant upon ISPs to self-report advertised download and upload speeds.⁴⁶ Self-reported provider data plagued the last iteration of FCC maps and will likely to continue to hinder the speed-based accuracy of its new maps. Properly mapping underserved locations relies on accurate speed test data, which is unlikely to align to the ISPs advertised speeds. Although Mbps download/upload speeds typically fluctuate throughout the day, many Americans have found that the speeds they

have access to differ greatly from those advertised by their ISP.⁴⁷ Addressing the shortcomings with the advertised speed data provided by ISPs is going to be key to securing an accurate picture of connectivity in PA and will greatly aid in allocating funding to the “underserved” bucket of subgrantee funding.

Mapping Broadband Access Speeds

While location fabric data is the gold standard of broadband availability mapping, many independent researchers, organizations, and states utilize speed test data from Ookla and M-lab to determine broadband speed data. Both companies run popular connectivity “speed tests.” The speed tests, accessible via a browser or mobile device application, test the latency and download and upload speed of a users’ internet connection. Ookla is a private, for-profit company that generates funds by selling its data to third parties and industry partners.⁴⁸ M-lab, on the other hand, is a non-profit run by researchers and industry (primarily Google) and public sector partners. Both platforms require users’ consent to retain and publish their IP address.⁴⁹ Ookla and M-Lab then publish anonymized user results in open-source databases.

While Ookla and M-lab deliver generally accurate connection speed results, they are not a strong proxy for broadband availability mapping. For example, both speed tests are limited in geolocation accuracy. Both tests map to the city and county level, with Ookla data being available at the census block level.⁵⁰ The services aggregate speed test results and publish the median Mbps download speed in the services’ respective location-level format. Thus, the speed tests limit the extent to which researchers may derive granular location-level data. Additionally, the accuracy of Ookla and M-lab tests rely to a large extent on the proximity of users to an affiliated host server. Generally, the closer a user to a host server, the more accurate speed test

data will be. Likely due to its longer time in existence, Ookla has a distinct advantage in server count, with over 1,600 host servers in the United States, compared with M-lab's 60 as of 2020.⁵¹

Another limitation of the speed tests is the requirement that users actively opt-in to take a speed test. Thus, speed test data can be limited by a lack of raw user data. This can lead to vast differences in data between Ookla and M-lab speed tests. For example, in Forest County, a rural county in southwestern PA, M-lab speed test results show a median download speed of 111.90 Mbps, the fastest in PA. Ookla results, however, show a download speed of 26.46 Mbps, placing the county in the underserved category by BEAD standards.⁵² Ultimately, speed test results, despite being the most accurate way to measure broadband speeds, are limited in their ability to provide accurate data on location-specific broadband availability and require a large raw user dataset to develop truly accurate speed data.

III. Case Studies

Attempts to Accurately Map Broadband Data Within Pennsylvania- Penn State Extension and the Southwestern PA Commission

Due to the limitations of FCC data, several organizations within Pennsylvania have developed their own broadband maps. In 2020 the PA Public Utility Commission, in partnership with Penn State Extension (the community education network of Penn State University), created a map designed to inform private sector companies of potential expansion opportunities in underserved PA communities (see Appendix A). The comprehensive map shows existing broadband connections within PA, sortable by factors such as existing broadband infrastructure, household density, demographics, and income.⁵³ The map also shows which areas may have

access to state and federal development grant funds and plots existing broadband and wireless infrastructure throughout the state.⁵⁴ The map also highlights underserved PA census blocks.

The public facing Penn State Extension map relies upon FCC Form 477 data, however, limiting its utility as a granular look at household-level broadband connectedness data. Additionally, the public facing map does not explicitly showcase Mbps download and upload speeds, limiting its ability to serve as a check on the upcoming FCC maps. Notably, however, the researchers on the project collected confidential information from ISPs that it did not publish in the public facing maps. The researchers also collected speed test data, which also was not shared on the official public facing map. Harry Crissy, one of the researchers on the project, told CNET reporter Shara Tibken that the decision not to publicly share this information was made because of pushback from ISPs.⁵⁵

The Southwestern PA Commission (SWPAC), in collaboration with Carnegie Mellon University, has also developed an interesting map showcasing PA broadband availability. SWPAC's map (see Appendix B) only includes data for the ten counties in southwest PA. The SWPAC map examines broadband and mobile LTE speeds, access to broadband connections, demographic information, and available broadband plans and costs in the area. The planning team utilized these data points to create an "equity index," which identified gaps in "regional access, adoption, and affordability."⁵⁶ The SWPAC map also includes existing broadband infrastructure and potential access to grant funding. The SWPAC map utilizes census block-level Mbps download and upload speeds, derived from aggregated median speeds provided by Ookla and M-lab speed tests, as well as FCC data. The SWPAC map provides generally accurate speed results and represents an important look at equity and affordability in PA broadband access.

Lessons Learned from the Penn State Extension and SWPAC Maps

Strengths: The Penn State Extension and SWPAC’s broadband maps provide excellent baselines for a future comprehensive PA statewide map. Both maps are notable because they map the infrastructure underlying both fixed and wireless broadband deployment. This is useful because it provides ISPs and state officials with an understanding of where infrastructure gaps exist throughout the state. The wireless component of the maps is also important, as the NTIA will give priority consideration to projects that expand advanced wireless technology.

The SWPAC’s focus on equity is another distinctive differentiating factor. The NTIA has indicated that affordability will be an important consideration for subgrants. Creating an equity index like SWPAC that factors in cost, demographics, and digital adoption rates would be highly beneficial to PA’s subgrant dispersal efforts. Finally, the SWPAC map’s use of Ookla and M-lab speed test data provides the most accurate look at broadband availability speeds in the state. The NTIA also utilized speed test data in a similar manner to create its “National Broadband Availability Map.”⁵⁷ Given the accessibility of the speed test data, this approach is likely scalable in a relatively short amount of time

Weaknesses: Neither map utilizes a location fabric, which ultimately limits its ability to provide granular, address-level broadband access data. Granular, address-level data is needed to make the most accurate broadband funding decisions based on unserved locations, the most important bucket of funding. Additionally, SWPAC’s equity index may take considerable time and effort to scale to a statewide mapping effort.

Efforts to Accurately Map Broadband Speeds and Engage Stakeholders- Maine and Virginia

Like PA, Maine struggled with mapping due to the high number of rural and remote areas in the state. To address these issues, Maine created the Connect Maine Authority (ConnectME).

ConnectME has collaborated with private and nonprofit organizations across the state to create the Maine Broadband Coalition (MBC). The MBC has launched several public advocacy campaigns across the state. For example, MBC worked with M-lab to create its own speed test survey (see Appendix C) for residents in the state.⁵⁸ The test begins with a survey prompting respondents to enter location and ISP information, followed by a speed test. In conjunction with the speed test, MBC launched a public campaign asking Maine residents to take the survey. As of April 20, 2022, over 34,041 speed tests had been collected and mapped because of the initiative.⁵⁹ Maine has utilized this speed test data to successfully launch several broadband grant programs, including successful federal grant award applications.⁶⁰

ConnectME is also notable for its collaboration with stakeholders across the state to support grant initiatives and improve broadband literacy in local governments. For example, ConnectME hosts workshops to answer questions and present new broadband information aimed at helping local stakeholders learn about broadband initiatives at the state and federal levels.⁶¹ In addition to its workshops, ConnectME operates two grant programs designed to introduce broadband knowledge and advocacy to local stakeholders. ConnectME's Community Broadband Startup Grants provide funding for local communities to plan for the expansion of broadband services. These grants are intended to be used by community leaders to develop "...a description of local broadband needs and goals; inventory the existing infrastructure assets; a gap analysis defining the additional broadband infrastructure necessary to meet identified needs and goals; an assessment of relevant municipal procedures, policies, rules and ordinances; and a strategy to promote digital inclusion that addresses affordable internet service and equipment, digital literacy and public computer access."⁶² Connect Maine's other grant program, the Community

Broadband Planning Grants, are intended to help local governments “take the next step” by creating a solid broadband development plan with actionable steps for completion.⁶³

Virginia, facing challenges similar to PA and Maine, created Commonwealth Connect to coordinate broadband planning policies in the state. Commonwealth Connect has set ambitious goals to provide internet services to at least 95 percent of VA households.⁶⁴ To do so, Commonwealth Connect has embarked on large-scale stakeholder engagement initiatives. For example, Commonwealth Connect created the Commonwealth Connect Coalition, which brings together private, nonprofit, and government entity partners to support broadband expansion in Virginia.⁶⁵

Virginia’s Commonwealth Connects website also features a “Broadband Toolkit,” which features a primer on broadband technology and a step-by-step development guide for use by local government entities. To further promote local development initiatives, Virginia offers Community Development Block Grant funds, which are to be used by local government entities for “planning grants, developing local innovation grants, implementation and economic development, and large-scale local level projects.”⁶⁶ Like Maine, Virginia also created a broadband speed survey (see Appendix D) for its citizens. Unlike Maine, however, Virginia’s test is more qualitative in nature, asking for respondents to provide their address, type of internet connection (e.g. DSL, fiber, etc.), to and rate their service out of five stars.⁶⁷ This is likely due to concerns that survey response rates might decline if respondents must also complete a speed test.

Lessons Learned from Maine and Virginia

Strengths: Maine, perhaps because of its small size, has utilized stakeholders outside of its state government office as well as any state in the US. Maine was able to leverage community

partnerships and public advocacy campaigns to encourage Maine residents to take speed tests. This is important because speed test data accuracy relies upon having a large set of raw user test data. Additionally, Maine and Virginia have both successfully utilized grants and outreach programs to educate local government leaders on the importance of broadband. Through these grants Maine and Virginia have empowered local governments to take accountability for broadband expansion in their communities. Local government collaboration is central to BEAD funding guidelines, with final plan approval contingent upon proving there was successful collaboration between state and local government entities. However, many local governments are understaffed and lack up-to-date knowledge on broadband policy. It will be essential for PA to provide educational programming and troubleshooting services at the state level to help local government entities navigate the complicated broadband and BEAD project landscape.

Weaknesses: Maine's stakeholder engagement efforts are aided by the small size of the state, which makes coordination and outreach efforts easier. Pennsylvania is almost 13 times the size of Maine, creating outreach challenges for the PA Broadband Authority and PA DCED. PA should address these issues by utilizing a central hub on its website, like Virginia's, to store and disseminate updated broadband information. This will make it easier for local government entities to search for information. For example, North Carolina, a similarly large state, keeps local broadband planning guides and development playbooks on its broadband authority website.⁶⁸ Additionally, the PA Broadband Authority might look to pre-record and post webinars on its website covering several aspects of the BEAD program and/or explaining state broadband maps. It might also look to hold statewide stakeholder listening sessions to determine local government officials' primary questions and concerns about the BEAD program.

Efforts to Map Unserved Areas- Georgia and US Telecom

Georgia is considered by most experts to have the most granular and accurate broadband availability map (see Appendix E) in the US.⁶⁹ This is because Georgia collaborated with the Carl Vinson Institute of Government at the University of Georgia and the location data company Lightbox to create a remarkably accurate location fabric. Like the FCC's planned location fabric, Georgia's location fabric was created using data bought from private data providers and combined with county tax appraiser parcel data, US Postal Service address data, Microsoft building rooftop data, and electricity meter location information.⁷⁰ Georgia then collaborated with ISPs to secure address-level service availability data. ISPs have traditionally been unwilling to share this level of granular data with government partners due to fears of publicly exposing proprietary data. To assuage those concerns, Georgia passed the Achieving Connectivity Everywhere Act, which ensures that ISP data used to create the map would remain confidential.⁷¹ The ISP service data was then checked against the state's master address file and returned to ISPs for correction, if needed.⁷² The final ISP data was then overlaid with the location fabric to create an extremely accurate picture of broadband availability in the state.⁷³ Through its new broadband map, Georgia found over 250,000 unserved households that were previously considered connected by the FCC's map.⁷⁴

US Telecom is a trade and lobbying organization that represents American telecommunications providers. Recognizing the need for reliable broadband data, US Telecom, in conjunction with several partners, embarked on a broadband mapping project in Missouri and Virginia. US Telecom worked with CQA (which was later awarded the FCC broadband mapping contract) to develop a location fabric technique to map granular location-level data. CQA utilized multiple sources of address, parcel, and building data inputs to build the location fabric.⁷⁵ It also worked with ISPs to secure address-specific data, which it then overlaid with the location fabric

to create its broadband access map.⁷⁶ Notably, US Telecom and CQA were not able to secure ISP address-level data as effectively as Georgia, resulting in a slightly less reliable map and highlighting the importance of state policy in constructing accurate broadband availability maps.⁷⁷ US Telecom and CQA also incorporated managed crowdsourcing to authenticate the accuracy of difficult to verify location-specific data.⁷⁸ For example, if data sources did not align, company personnel and volunteers would visually review the data sources to identify a location and determine where its geocoordinates should be placed.⁷⁹ This crowdsourcing method is an innovative approach to verification that is unique to US Telecom's project.

Lessons Learned from Georgia and US Telecom

Strengths: Georgia and US Telecom's broadband maps highlight the importance of collaboration with location data providers. Both Georgia (Lightbox) and US Telecom (CQA) contracted with prominent location data companies to develop a location fabric that made mapping to the address-level far more accurate. These efforts likely served as inspiration for the FCC in developing its new broadband maps. Georgia and US Telecom's maps also demonstrate the importance of effective state policy. Georgia was able to build a more accurate map through close coordination with ISPs. Georgia's collaboration, which included shielding proprietary data from public view, incentivized ISPs to provide data at an address level more granular than the FCC is likely to receive through its new Form 477 reporting requirements. Georgia also collaborated with a university partner, which is perhaps encouraging to PA given that the two best maps in the state were developed in large part by universities. Finally, US Telecom showed that managed crowdsourcing can be an effective method for correcting deficiencies across data sources.

Weaknesses: The mapping approaches taken by Georgia and US Telecom were large-scale and time intensive projects. Georgia and US Telecom representatives told GAO investigators their “state-level efforts have been complicated, long-term, and have involved significant computing power and labor hours spent integrating data from multiple sources that were inconsistent or incomplete.”⁸⁰ In gauging whether to develop its own location fabric map, PA will have to carefully weigh the potential time and monetary constraints. PA will also need to carefully consider to how closely it wants to collaborate with ISP providers. While Georgia’s confidentiality law secured industry buy-in, it also makes it more difficult to publish an accurate picture of equity within the state, particularly concerning broadband plan costs.

Looking Abroad for Broadband Strategy

The Netherlands boasts one of the world’s highest and fastest broadband penetration rates, with 99 percent of rural and urban areas covered by network download speeds of at least 100 Mbps.⁸¹ The Dutch have achieved this lofty goal in large part through their Dutch Digitalization Strategy initiative. Since 2018, the Dutch government has prioritized high-speed fiber-optic cable deployment throughout the country. In the most recent iteration of its Digitalization Strategy, the Dutch government set a goal that every home in the Netherlands would have access to 1 Gigabyte per second (Gbps) download speeds by 2023.⁸² Currently, over half of Dutch households have access to 1 Gbps speeds.⁸³

Local government entities play a key role in the Netherlands’ success. In 2020, the Ministry of Economic Affairs and Climate Policy, the federal agency responsible for broadband development, strategically increased its cooperation with the Association of Netherlands Municipalities and municipal authorities across the country. Together, federal and state officials have worked to update guidelines and information materials to harmonize local policy on fixed

and mobile networks.⁸⁴ The officials have primarily looked at synchronizing regulations and fees across municipalities to decrease fiber-optic cable deployment costs for ISPs.⁸⁵

The Dutch utilize a market-based approach, with private ISPs serving as the dominant broadband providers in the country. Although they oversee a market-based system, the Dutch regulatory authority, the Netherlands Authority for Consumers and Markets (ACM) is willing to interfere in the market if competition among ISPs is deemed unfair. For example, the ACM recently investigated a dispute between Dutch telecom provider KPN and fiber-optic cable company Glaspoort. KPN and Glaspoort control a large percentage of the fiber optic cable network in the country. ISPs in smaller cities and towns are typically forced to connect to their networks to secure fast service. The ACM investigated the matter and determined that the arrangement created unfair market conditions.⁸⁶ KPN and Glaspoort eventually entered into an agreement with the ACM to offer unbundled fiber-optic access while lowering tariffs for consumers. The agreement is expected to save Dutch consumers over 200 million euros per year and increase high-speed broadband uptake.⁸⁷

Lessons Learned from the Netherlands

Strengths: The Netherlands has done a remarkable job of connecting its communities to high-speed broadband access. Notably, the federal government has focused its efforts on high-speed cable-optic fiber deployment and set ambitious target goals for consumer access speeds. PA would do well to follow suit and consider setting ambitious target speeds for subgrantee applications that exceed the 100/20 Mbps speeds mandated by NTIA. This would “future-proof” PA networks and earn priority broadband consideration from the NTIA. Additionally, PA policymakers should emulate the Netherlands’ efforts at harmonizing local regulations and fees. Standardizing regulations and fees encourages private investment and reduces potential time

constraints to deployment. In an American context, North Carolina's Broadband Office recommends prioritizing dig-once policies, providing ISPs with easements allowing right-of-way access, and allowing ISPs to access lines of sight on government-owned towers and buildings for minimal fees.⁸⁸

Weaknesses: The Netherlands' ultra-fast internet comes at a cost to consumers- the Netherlands's average internet plan price ranks among the most expensive in the EU.⁸⁹ While the Netherlands can somewhat mitigate costs by ensuring appropriate competition and fair prices through regulation, PA generally lacks the authority to enact any cost-related regulations. In the US, the Communications Act of 1934 gives the FCC preemption over states when regulating telecom providers.⁹⁰ The FCC has largely chosen to regulate ISP internet plan prices through "silent preemption." This essentially means that by choosing *not* to regulate the prices of ISP internet plans, the FCC is setting a policy that internet plan prices are not to be regulated by *anyone*. Therefore, if PA chooses to use BEAD funds to support the construction of ultra-fast fiber-optic cable deployment like the Netherlands, it should look to secure some level of assurance from subgrantees that internet plan prices are to be maintained at an agreed-upon reasonable level. The NTIA, for its part, already requires subgrantees to provide a low-cost plan for low-income households.

IV. Recommendations

The following six recommendations are listed in descending order, from highest to lowest priority. These recommendations are designed to provide PA with an actionable and practical plan for securing the maximum amount of BEAD funding and distributing the allocated funds in an effective manner.

1. *PA DCED and the PA Broadband Authority should begin to gather the information that will be needed to submit a Letter of Intent to the NTIA to participate in the BEAD program and generate a 5-year action plan to access planning funds*

While the NTIA will likely not officially release a Notice of Funding Availability, and associated application guidelines, until May 22nd, 2022, it has indicated the types of information *likely* to be required. That information is outlined in Section III- *BEAD Funding Details and Timeline* in this report. Pennsylvania should get out ahead of the May 22nd release by immediately beginning to put together the information likely to be needed for the LOI and 5-year action plan. While there is unlikely to be a quick deadline from NTIA to submit this information, early submission will benefit Pennsylvania greatly. The earlier Pennsylvania submits its LOI and five-year action plan, the sooner it can expect to receive the \$5 million in planning money guaranteed by BEAD. Receiving this money is of paramount importance, as it will allow Pennsylvania to develop its own comprehensive broadband maps and execute stakeholder engagement strategies more quickly.

2. *PA DCED and the PA Broadband Authority should develop a comprehensive plan to engage relevant stakeholders*

Engaging local government entities is an essential component of BEAD funding. To receive funding, states must demonstrate they have worked with local officials to develop their subgrantee plans. While local governments provide valuable ground-level knowledge and expertise in local environments, they are oftentimes stretched thin from a personnel standpoint and may struggle to understand some of the technical and statutory requirements of the BEAD program. To address this, PA should develop a comprehensive stakeholder engagement plan with two key aims:

- Educational Support- Local government entities in PA will need support parsing through and understanding the statutory requirements needed to apply for BEAD subgrants. The PA DCED should hold periodic online webinars designed to explain the BEAD program and update local entities on shifting NTIA guidelines. These webinars should be recorded and posted on a prominent central hub on PA DCED’s website, here referred to as a “broadband toolkit.” PA DCED should also develop a background primer on broadband technology, as well as a step-by-step planning guide for broadband development and a step-by-step guide for accessing BEAD subgrant funds for local government entities. These guides should also be a part of the “broadband toolkit.” PA DCED and the PA Broadband Authority should also convene several stakeholder engagement sessions with local government planning officials over the coming months. The goal of these sessions should be to learn about ongoing issues at the local level and answer questions from local officials. PA DCED can also coordinate information outreach with nonprofit organizations like the Pennsylvania Municipal League. Finally, PA DCED should consider developing broadband-specific community block grants to provide municipalities with funding for planning, personnel, and development purposes.
- Regulatory Standardization- PA DCED and the PA Broadband Authority should create a task force with local government officials aimed at reviewing local regulations across the state that impact broadband development. The goal of the task force should be to identify regulatory impediments to broadband deployment (such as pole fees and right-of-way easement issues) across the state. The task force could then develop a set of standardized regulatory procedures that local governments across the state will be asked to adopt to expedite broadband development projects throughout the state.

3. *PA DCED should build a broadband map showcasing accurate broadband speeds across the state using speed test data*

Pennsylvania is sorely lacking a public facing broadband map that accurately shows broadband access speeds throughout the state. While the Southwestern PA Commission has developed an accurate speed map, it is limited to the ten counties in its region. Penn State Extension may have access to such data; if so, it should be published for public use. Publishing an accurate speed map is essential for PA's BEAD program preparedness. The second most important BEAD funding bucket is earmarked for improving broadband speeds in underserved areas, i.e. those lacking 100/20 Mbps speeds. If PA does not develop its own speed map, it will be reliant upon the upcoming FCC map to allocate funding to underserved communities. This is problematic because the new FCC map will still rely upon self-reported advertised speed info from ISPs. This info has historically proven to be inaccurate, and there is little reason to expect the data to be more accurate this time around. Instead, the PA DCED should embark on an effort to build its own broadband speed map. To put together its map, PA DCED should:

- Develop a Public Advocacy Campaign and Collaborate with a Speed Test Provider to Create a Public Survey- Because speed test data is highly reliant upon raw user numbers for accuracy, PA DCED should utilize BEAD planning funds to create a public advocacy campaign aimed at getting Pennsylvanians to take a speed test. Like Maine, the survey could ask users to provide information like their address and ISP provider. Perhaps PA DCED could launch a summer speed test campaign aimed at gathering as much raw data as possible before the September 1st FCC Form 477 filing deadline for ISPs. PA DCED could collaborate with a speed test provider like M-lab or Ookla to link speed test data directly to a map that plots speed test data throughout the state using GIS technology.

New speed test data could be combined with older speed test data already held by Ookla or M-lab to create an accurate picture of broadband access speeds in PA. PA DCED should also consider collaborating with the NTIA, which provides state planning and mapping assistance through its “National Broadband Availability Map” initiative.⁹¹

- Work with Penn State Extension and SWPAC to combine map data- Both maps contain excellent baseline data featuring broadband and wireless infrastructure locations and equity measures like broadband plan affordability and demographic information.

Combining the data from the SWPAC and Penn State Extension maps with a large number of accurate speed test measurements would create a more comprehensive map and put PA in a strong position to challenge any speed-based inaccuracies in the upcoming FCC broadband maps.

4. *PA DCED should consider developing a location fabric-based broadband map and explore vendor options*

PA currently lacks any maps that can purport to accurately show granular, address-level data. This will be true even if PA DCED follows recommendation #3 above and creates an accurate picture of broadband speed availability in the state. This is because speed test data, while useful for generating a picture of broadband speeds at the county or census block level (and even better if combined with a survey asking for respondent address), is still a poor proxy for address-level location accuracy. Creating a location fabric is the best way to get an accurate picture of granular, address-level access data. However, contracting with a location data provider to create a location fabric has proven to be a costly and time-consuming endeavor for Georgia and US Telecom. The location fabric being built for the new FCC maps also looks highly promising. Still, PA DCED should meet with potential location data

vendors and explore the possibility of creating its own location fabric. After getting cost and time estimates, it can conduct a cost/benefit analysis to determine if creating a location fabric at this stage is a worthwhile endeavor. It is worth exploring creating a location fabric for two reasons:

- Without its own location fabric, PA is almost totally dependent on the new FCC maps for BEAD funding allocation. BEAD funding will be 100% based on the proportion of unserved locations in a state, which is best measured with a location fabric as a baseline. Without its own location fabric-based map, PA will be left in a weak position to challenge any unserved location-related data in the new maps. This could seriously jeopardize the amount of funding PA may receive from the NTIA.
- With its own location fabric, PA can continually update data inputs and use the resulting broadband map to accurately drive funding and planning decisions for years to come. With an accurate location fabric serving as a base, PA can work with Penn State Extension and/or SWPAC to combine data from their maps and add speed test data from recommendation #3. This would almost certainly result in the best broadband map in the US. Having its own ultra-granular maps would greatly improve PA's own planning process and put it in an extremely strong position to maximize its NTIA funding allocation and award broadband provider subgrants.

5. *PA DCED and the PA Broadband Authority should consider future scalability when awarding subgrants*

The NTIA defines priority broadband projects as ones that are scalable to meet the evolving needs of households and businesses, as well as those that support advanced wireless technologies like 5G. PA DCED and the PA Broadband Authority should

consider, whenever possible, prioritizing subgrant proposals that offer to build broadband networks with Mbps download and upload speeds that exceed the NTIA's 100/20 Mbps requirement. This will likely mean that PA prioritizes projects that deploy and utilize fiber-optic cable networks. This will ensure high speed broadband and wireless connectivity that can be scaled to meet future network and technological needs. While awarding these subgrants, PA DCED should also be sure that subgrantees offer to provide cost effective plans to ensure equity of access.

6. *PA lawmakers should consider amending or repealing 66 Pa. Cons. Stat. Ann. § 3014(h)*

66 Pa. Cons. Stat. Ann. § 3014(h) is a provision in PA's public utility code that prohibits municipalities from charging a fee for broadband services unless ISPs have refused to service the location. 66 Pa. Cons. Stat. Ann. § 3014(h) conflicts with the BEAD programs' statutory language in the IJJA. BEAD explicitly forbids discriminating against subgrantee proposals from municipal broadband networks. 17 other states have similar laws, all but ensuring a legal battle in the coming months. To avoid costly and time draining litigation, PA lawmakers should consider repealing or amending 66 Pa. Cons. Stat. Ann. § 3014(h).

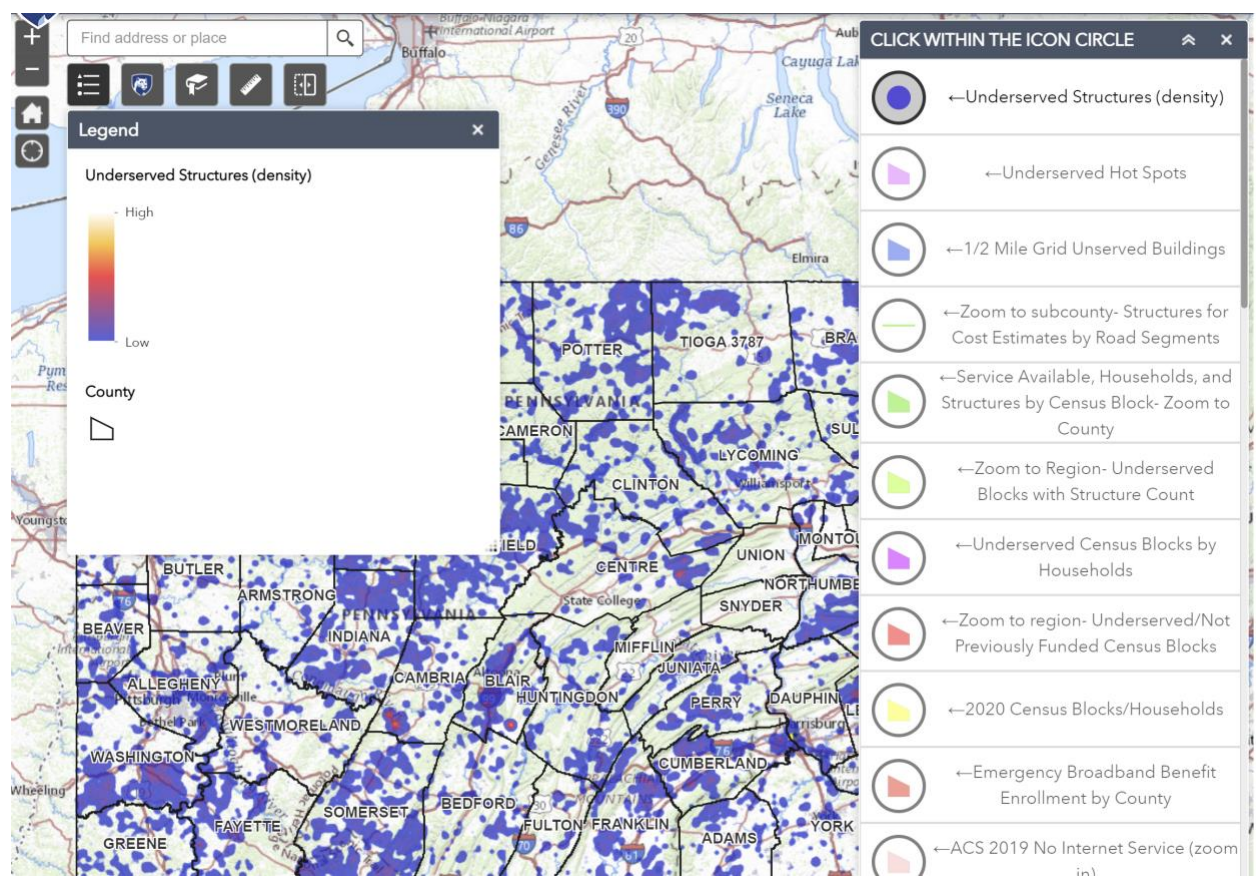
V. Conclusion

Throughout the analysis of the BEAD program and FCC mapping initiatives, four key themes emerge: 1) data accuracy and granularity; 2) stakeholder engagement; 3) Equity in cost and access; and 4) project scalability. To administer BEAD funding effectively and efficiently, state officials will need to carefully consider how they can support initiatives targeting these areas. The six recommendations outlined in this report address the themes listed above and have the potential to place Pennsylvania at the forefront of broadband development in the US. With

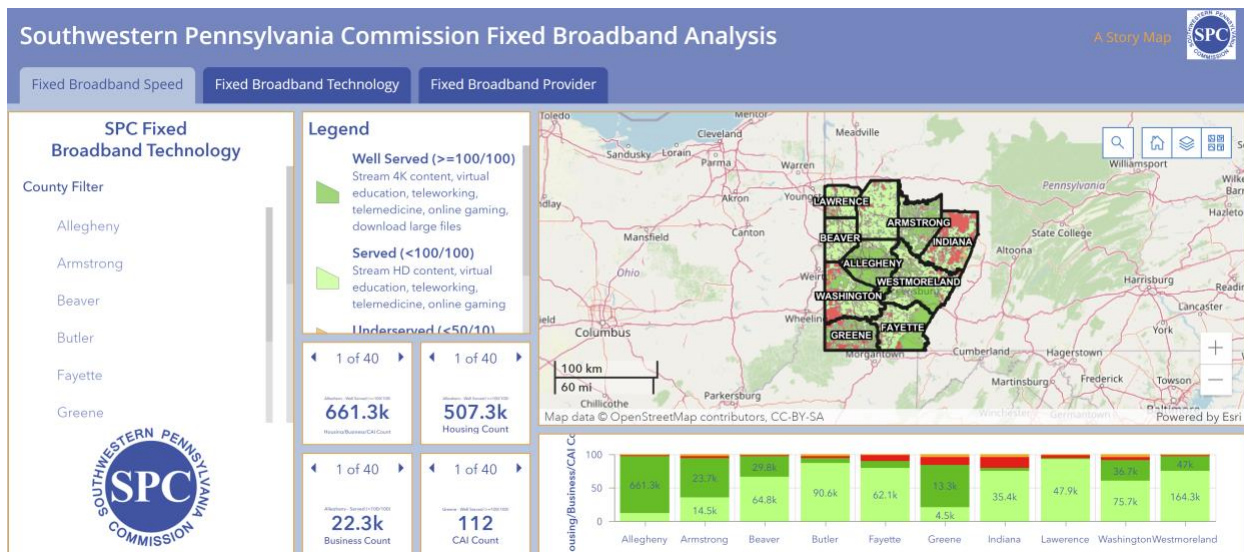
additional funding guidance still to come from NTIA in the coming months, it is essential for PA DCED to get ahead of the curve and put itself in a strong position to maximize allocated BEAD funding and improve subgrant efficacy.

VI. Appendix

A. Penn State Extension Broadband Map



B. Southwestern PA Commission Broadband Analysis Map



Appendix C. Maine Broadband Coalition Speed Test Survey and Speed Test-derived Map

[Español](#)**Welcome to Maine crowd-sourced broadband project.**

From this web site we can collect data about your broadband speed and create a map for your community that will help your community in efforts to get grants and other support to improve broadband for your community. Select below the action you wish to take.

Please make sure that no one in your household is streaming videos or gaming while you take this test. If you are connected to **school or work**, please turn off your **VPN** during this test. If you don't know what a VPN is, then you are ready to take the test.

Unless you enter an address with no available service, **the address that you enter should be the address where you are right now.**

click on choice

- Enter my exact address
- Enter my partial address (if you are concerned about privacy, choose this)
- Enter an address with **NO AVAILABLE SERVICE**

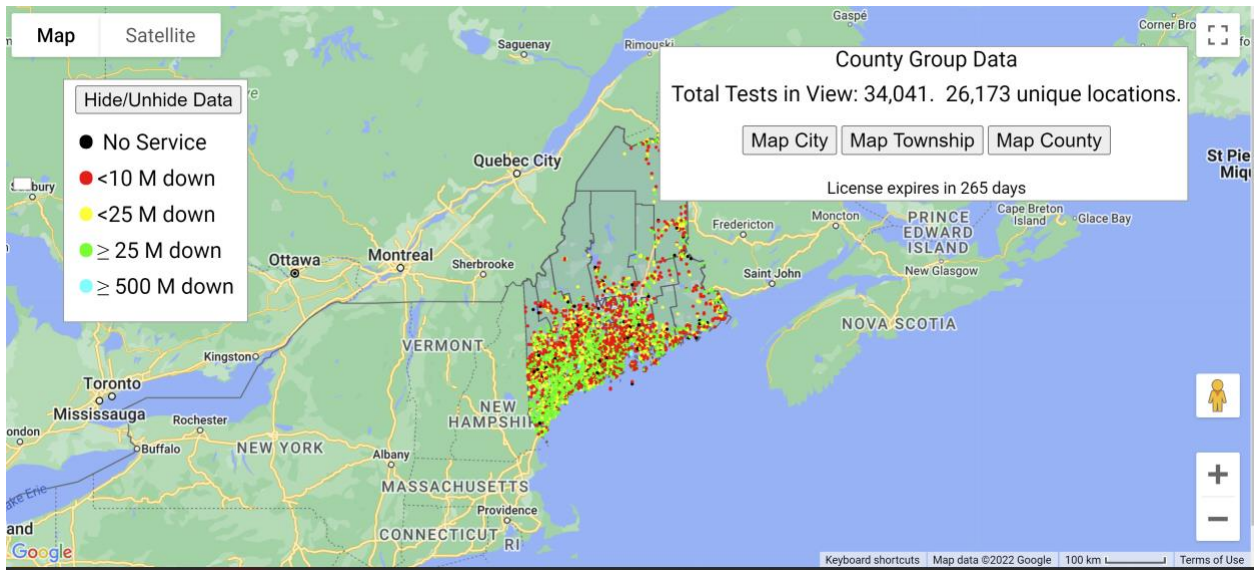
 Your contact email (optional)[Let's do it](#)

We **do not** use tracking cookies.

We **do not** store your address.

We **will** store your location and speed test results.

[Please review this Disclaimer.](#)



Appendix D. Virginia Broadband Community Survey

Broadband Survey

NOTE: Only one survey per household. "Required" means we need the answer to this particular question.

What is the county or city in which your residence is located?*

- Select -

Address*

Example: 555 Main St.

Address 2

Address 2

City/Town*

Example: Springfield

ZIP/Postal Code*

5 digits only, Example: 23456

Does this household currently subscribe to Internet service?*

- Select -

What kind of Internet connection do you have at home?

- None -

Please rate your home Internet service: ★★★★★

- 1 Star - Poor, meets none of my needs
- 2 Stars - Below Average, meets few of my needs
- 3 Stars - Average, meets some of my needs
- 4 Stars - Above Average, meets most of my needs
- 5 Stars - Excellent, meets all of my needs

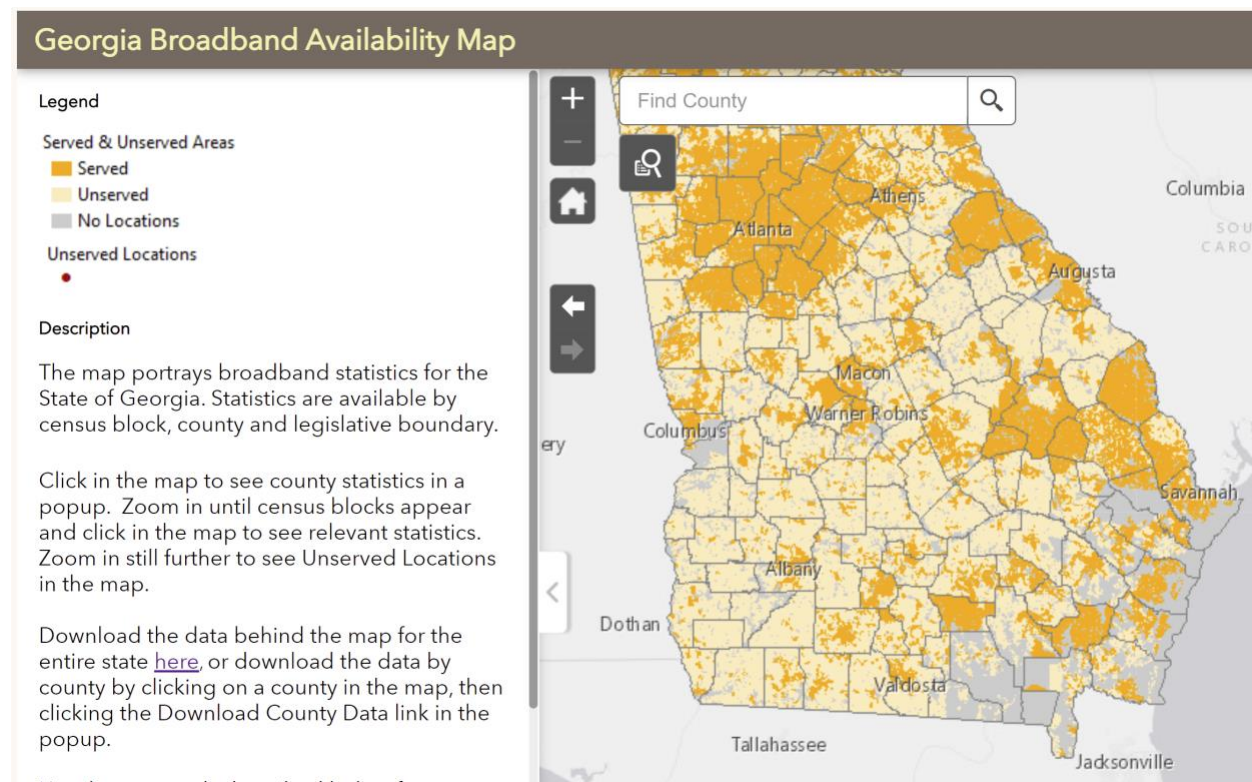
If broadband, or additional broadband service options, were offered to your household, would you be willing to commit to a year-long contract to take that service?*

- Select -

Would you be willing to pay a small fee (e.g. \$2.50/month) to support bringing broadband to your household, or community?*

- Select -

Appendix E. Georgia Broadband Map



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