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A summary of Broadband Equity, Access, and Deployment (BEAD) Program plans for the 4 Telehealth Broadband Pilot Program states

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Key Takeaways

- All four Telehealth Broadband Pilot (TBP) Program states ranked among the top half of United States and territories for Broadband Equity, Access, and Deployment (BEAD) Program funding allocations: Alaska (19), Michigan (4), Texas (1), and West Virginia (11).
- Despite receiving the largest BEAD funding allocation of any TBP Program state (more than $3.3 billion), Texas has the lowest allocated cost per unserved or underserved Broadband Serviceable Location (BSL) of $2,900.06. This is related to the fact that Texas also had the largest number of unserved and underserved BSLs of any TBP state.
- Alaska received the lowest allocation of BEAD funds of any of the four TBP states (less than $1.02 billion) but has the highest allocation of BEAD funds per unserved or underserved Broadband Serviceable Location for any TBP state: $9,635.11.
- In order to achieve the BEAD goal of ensuring broadband access to all residents, state broadband offices may have to address additional challenges at the level of individual BSLs, where the user experience of broadband may not be consistent.

Background

With the passage of the Infrastructure Investment and Jobs Act in November 2021,[1] the Broadband Equity, Access, and Deployment (BEAD) Program is a planned $42.45 billion investment in broadband infrastructure across the United States and territories.[2] The goal of the BEAD Program is to ensure everyone in the U.S. states and territories has access to broadband by 2030.[3] The BEAD Program Notice of Funding Opportunity was released in May 2022, with five-year spending plans and initial spending proposals due in 2023, and final proposals due near the end of 2024. As of November 2024, the National Telecommunications and Information Administration (NTIA) has approved BEAD plans for all United States (U.S.) states and territories, enabling states and territories to begin the process of requesting their allocated

funding to implement their approved plans.[3] Final BEAD Proposals—including each state and territory's process for selecting providers and bids to implement their BEAD plans—must now be submitted for public comment and ultimately approved by NTIA to begin receiving BEAD funds.

Prior to 2022, the most granular broadband data the Federal Communications Commission (FCC) provided came from the administrative Form 477 and presented broadband access information at the level of the census block, including unique internet service providers (ISPs) providing services to at least one location within the census block, and the maximum download and upload speeds advertised across all locations within that census block.[4] One of the challenges with this approach was that if an ISP provided service to any location within a census block, all locations within the block were classified as receiving service, obscuring variation within the census block. Thus, this level of reporting made precise estimates of broadband need more difficult. In order to equitably allocate BEAD funding to communities in greatest need, the Federal Communications Commission (FCC) worked with experts, ISPs, other stakeholders, and members of the public to generate and refine broadband access data at the level of individual Broadband Serviceable Locations (BSLs) in a map referred to as the BSL Fabric (or simply the Fabric).[5,6] The FCC defines a BSL as "a business or residential location in the United States at which mass-market fixed broadband internet access service is, or can be, installed."[7] Thus, the Fabric is the most representative and granular data available of broadband access to date. The Fabric will be used to identify locations and areas in greatest need of broadband investment to prioritize BEAD Program funding.

The BEAD Program prioritizes service of unserved locations first, defined as locations having either no broadband service or service below a minimum threshold of at least 25 Megabits per second (Mbps) download, at least 3 Mbps upload, and latency of less than 100 milliseconds (25/3/100).[8] Underserved locations are second in funding allocation priority, defined as meeting the 25/3/100 standard, but still below the new broadband threshold of 100 Mbps download speed, 20 Mbps upload speed, and 100 milliseconds (ms) latency (100/20/100).[8] Finally, if any BEAD Program funding remains, Community Anchor Institutions are next in funding allocation priority, defined by the FCC as entities "such as schools, libraries, health clinics, health centers, hospitals or other medical providers, public safety entities, institution of higher education, public housing organizations, or community support organizations that facilitate greater use of broadband service by vulnerable populations."[9] Thus, an analysis of unserved BSLs, underserved BSLs, and all Community Anchor Institutions is an important component of understanding BEAD Program funding allocations.

Prior to the launch of BEAD and the passage of the Infrastructure Investment and Jobs Act, the Telehealth Broadband Pilot (TBP) Program began in January 2021 through the launch of the Rural Telehealth Initiative (RTI). The RTI was created through a Memorandum of Understanding established in September 2020 between the FCC, U.S. Department of Health and Human Services (HHS), and U.S. Department of Agriculture (USDA). The purpose of the TBP Program was to understand and address gaps in broadband service that limit access to telehealth services in rural communities. The National Telehealth Technology Assessment Resource Center (TTAC), based out of the Alaska Native Tribal Health Consortium, received $6.5 million to implement the TBP Program, and the Telehealth-Focused Rural Health Research Center through the University of Arkansas for Medical Sciences received $1.5 million to evaluate the TBP Program. TTAC implemented the TBP Program in 25 counties/county-equivalents (henceforth, counties) across four states: Alaska, Michigan, Texas and West Virginia.

As part of the TBP Program, an examination of BEAD spending plans and proposals in those four states was conducted to better understand the proposed efforts to improve broadband for the TBP Program counties. As can be seen in Table 1, according to the BSL Fabric's most recently available data (June 30, 2024),[10] the percentage of all identified BSLs in the 25 TBP counties with access to advertised download speeds of at least 25 Megabits per second (Mbps) and upload speeds of at least 3 Mbps (25/3 Mbps) for all wired and licensed fixed wireless residential connections varies from 0.0% (Bristol Bay Borough, Alaska) to 95.5% (Crosby County, Texas). The percentage of identified residential BSLs across the 25 TBP Program target counties with access to advertised download speeds of at least 100 Mbps and upload speeds of at least 20 Mbps (100/20 Mbps) for all wired and licensed fixed wireless connections ranges from 0.0% (Bristol Bay Borough, Alaska) to 95.0% (Crosby County, Texas). The difference in the percentage of county-level BSLs with access to wired and licensed fixed wireless connections at the 25/3 Mbps threshold relative to the 100/20 Mbps threshold varied, with some counties demonstrating little or no difference (e.g., Dillingham Census Area with 6.0% at 25/3 Mbps and 100/20 Mbps), and others demonstrating much larger differences (e.g., Roane County, West Virginia with 40.4% at 25/3 Mbps, but 27.1% at 100/20 Mbps).

Table 1. Percentage of Broadband Serviceable Locations (BSLs) meeting download/upload speed thresholds for all wired and licensed fixed wireless residential connections in each of the 25 TBP target counties.

			Percentage of BSLs with speeds at or above __ download (in Mbps) and __ upload (in Mbps)					
State	**TBP Target County/ County-Equivalent**	**Total BSLs**	**.02/ .02**	**10/ 1**	**25/ 3**	**100/ 20**	**250/ 25**	**1000/ 100**
Alaska	Aleutians West Census Area	1,557	60.0	59.1	40.0	40.0	40.0	0.0
	Bristol Bay Borough	1,186	85.9	85.9	0.0	0.0	0.0	0.0
	Dillingham Census Area	2,590	59.0	58.8	6.0	6.0	6.0	6.0
	Nome Census Area	4,625	81.9	42.9	36.5	31.7	31.7	0.0
	North Slope Borough	3,442	73.7	65.2	59.2	59.2	51.1	0.0
	Northwest Arctic Borough	2,655	85.1	32.2	32.2	32.2	32.2	0.0
Michigan	Gladwin County	19,706	86.5	75.1	72.1	68.2	63.7	1.2
	Manistee County	18,014	89.5	78.6	75.0	61.3	60.2	11.8
	Missaukee County	10,063	74.9	66.4	50.9	43.5	42.4	19.0
	Montmorency County	10,144	89.5	81.4	69.3	59.7	59.0	39.3
	Osceola County	14,774	67.1	45.0	43.4	39.3	30.1	21.3
	Oscoda County	8,685	86.9	76.8	64.5	59.3	59.2	47.2
Texas	Crosby County	3,806	97.2	96.2	95.5	95.0	89.0	74.3
	Fisher County	3,218	69.0	63.4	58.0	52.7	36.2	9.4
	Haskell County	4,706	90.8	89.5	88.0	79.3	78.6	78.6
	Jones County	9,796	85.7	77.7	58.3	55.4	53.4	25.8
	Lamb County	7,778	95.4	93.6	92.5	91.0	85.1	85.1
	Mitchell County	4,932	82.7	82.5	82.5	80.4	80.4	51.4
West Virginia	Calhoun County	4,367	44.5	35.2	24.3	20.8	1.2	1.2
	Clay County	5,129	65.4	53.5	27.7	16.9	15.6	3.7
	Jackson County	15,958	77.0	66.1	63.7	56.7	55.2	47.7

	Kanawha County	103,585	92.1	90.8	89.9	88.0	79.5	18.0
	Nicholas County	15,596	79.7	77.9	57.4	48.3	46.9	3.3
	Ritchie County	6,529	88.4	86.9	83.8	83.0	69.6	69.6
	Roane County	9,204	62.8	54.0	40.4	27.1	26.0	2.7

The percentage of all business connections meeting these same advertised download/upload speed thresholds for advertised wired and licensed fixed wireless connections can be found in Table 2. The range of percentages of business BSLs across the 25 TBP target counties with advertised download/upload speeds of at least 25/3 Mbps and 100/20 Mbps were similar to those for residential connections, from 0.0% in Bristol Bay Borough, Alaska (for both 25/3 Mbps and 100/20 Mbps) to 99.5% in Lamb County, Texas (for both 25/3 Mbps and 100/20 Mbps). However, some counties demonstrated very different advertised speed coverage for wired and licensed fixed wireless connections between residential and business BSLs. For example, the FCC Fabric reports that Jones County, Texas, has only 55.4% of all residential BSL fixed and licensed fixed wireless connections with advertised speeds meeting or exceeding 100/20 Mbps, but 94.2% of business BSLs meet this same threshold. Conversely, some TBP target counties demonstrated better coverage of residential BSLs than for business BSLs. For example, 88.0% of residential BSLs have advertised an advertised download/upload speed of at least 100/20 Mbps for wired and licensed fixed wireless connections, but only 29.5% of business BSLs meet this same standard for wired and licensed fixed wireless connections.

Table 2. Percentage of Broadband Serviceable Locations (BSLs) meeting download/upload speed thresholds for all wired and licensed fixed wireless business connections in each of the 25 TBP target counties.

			Percentage of BSLs with speeds at or above __ download (in Mbps) and __ upload (in Mbps)					
State	**TBP Target County/ County-Equivalent**	**Total BSLs**	**.02/ .02**	**10/ 1**	**25/ 3**	**100/ 20**	**250/ 25**	**1000/ 100**
Alaska	Aleutians West Census Area	1,580	41.8	41.2	38.9	38.9	38.9	0.0
	Bristol Bay Borough	1,171	86.3	86.3	0.0	0.0	0.0	0.0
	Dillingham Census Area	2,583	58.8	58.6	6.0	6.0	6.0	6.0
	Nome Census Area	4,487	48.5	38.9	32.3	30.0	30.0	0.0
	North Slope Borough	3,281	65.3	62.1	25.7	25.7	20.1	0.1
	Northwest Arctic Borough	3,197	87.4	33.1	33.1	33.1	33.1	0.1
Michigan	Gladwin County	19,625	62.2	38.6	30.9	21.6	11.9	3.6
	Manistee County	17,920	65.5	51.0	44.7	32.1	18.4	14.0
	Missaukee County	9,706	81.7	70.3	67.3	64.9	17.8	16.8
	Montmorency County	10,068	75.7	62.8	57.4	54.2	52.5	35.9
	Osceola County	14,958	88.6	79.4	73.5	71.2	24.7	22.8
	Oscoda County	8,572	60.7	45.9	42.3	37.9	34.9	33.7
Texas	Crosby County	3,841	99.3	98.7	95.2	94.4	91.9	73.7
	Fisher County	3,453	96.3	95.8	90.8	90.0	84.0	61.4
	Haskell County	4,700	97.6	97.4	92.5	84.0	83.3	80.5
	Jones County	9,775	97.9	97.6	95.2	94.2	88.7	74.8
	Lamb County	7,759	99.9	99.9	99.5	99.5	99.5	85.1

	Mitchell County	4,896	92.0	88.8	81.8	79.5	78.3	58.6
West Virginia	Calhoun County	4,337	35.5	24.9	24.4	22.4	1.2	1.2
	Clay County	5,125	37.3	21.5	17.6	10.5	3.2	0.1
	Jackson County	15,920	69.8	47.9	35.6	20.8	7.6	4.1
	Kanawha County	103,669	68.1	41.3	40.2	29.5	16.0	1.7
	Nicholas County	15,597	63.0	57.3	51.1	46.1	42.9	1.1
	Ritchie County	6,457	88.6	86.6	84.1	83.5	69.7	69.7
	Roane County	9,179	46.1	33.7	24.2	14.4	9.6	0.3

Broadband stakeholders in the TBP target states of Texas, Michigan, West Virginia, and Alaska anticipate several challenges that are likely to influence expansion costs. To standardize these costs for comparison across different areas, decision makers often examine the average "cost per passing," defined as the cost to bring broadband to a BSL such that service could be activated within 10 business days of a request.[11] Factors that can influence cost per passing include soil type, terrain, topology, weather and other environmental conditions—all of which may limit the types of broadband investment that can be reasonably undertaken in certain areas of the U.S. Some of the challenges faced by state broadband offices working to improve broadband access for all BSLs are related to the types of broadband connections that will be deployed. Broadband connections can largely be divided into two categories of deployment: buried and aerial technologies. Buried connections are brought to locations through connections installed underground. Fiber-optic cables made of glass or plastic—often referred to as simply "fiber"—currently transit the fastest broadband speeds available.[12] However, these cables are often buried in the ground, and rocky or clay-heavy soils can be more challenging and expensive to bore through compared to sandy or loamy soils. Ground boring requires specialized equipment and labor, and the boring process can be delayed or slowed due to ground conditions or navigation around other existing underground utilities. Additionally, areas with high water tables or bedrock close to the surface can present significant obstacles to fiber installation. In Alaska, the cost per passing is often much higher than anywhere else in the continental U.S., due to challenges such as permafrost, a lack of roads for transportation of construction materials, and many days of poor weather that do not permit ground boring.[12] The process of ground boring, when feasible, can also cause environmental impacts such as erosion, sedimentation in nearby water bodies, and disruption of local ecosystems, which can lead to additional future costs.

Fiber and cable can also be deployed aerially using existing utility poles, which—relative to ground boring—can be done more inexpensively if existing poles are already in place and accessible at low or no cost; however, these kinds of deployments are more susceptible to lightning, wind, ice, extreme temperatures, rodents, birds, fire, vandalism, and vehicle accidents that can damage these above-ground technologies.[13] Because aerial fiber is above ground, repairs and additions can usually be made more quickly than with buried fiber. Installation of buried fiber can be much more expensive than installation for aerial fiber due in large part to differences in labor costs, with median estimates of $16.25 per foot of installation for buried fiber and $6.49 per foot for aerial fiber.[14] Some of these higher costs of buried fiber installation can be offset by leasing pre-existing buried infrastructure.[15] Additionally, buried fiber can be more costly to install and repair.[16,17] However, buried fiber is better protected from many of the weather-related hazards that can damage aerial lines.[17] These considerations for buried and aerial fiber

are included to illustrate considerations that will influence the actual cost per passing in each TBP state to optimally allocate BEAD funds.

In the absence of state-specific contracts delineating individual projects in TBP target counties, the "allocated cost per passing" can be calculated by examining the overall among of allocated BEAD funding provided to each state divided by the total BSLs in need of investment (i.e., unserved and unserved BSLs). These calculations are provided in the state-level BEAD plan summaries below to facilitate an examination of funding that will be available to overcome broadband infrastructure and investment challenges identified by state broadband offices.

Summary of BEAD Plans for 4 TBP States

Alaska

The largest state by area at 570,865.8 square miles, broadband expansion challenges in Alaska are compounded by the state's unique geography.[18] With a population of only 733,391, Alaska is the smallest TBP state by population, but has the highest percentage of unserved and underserved locations of the four TBP target states. According to its five-year BEAD action plan, out of Alaska's 275,813 BSLs, 88,188 are unserved (32.0%) and 17,378 are underserved (6.3%), making the total percentage of unserved or underserved BSLs in the state 38.3% (105,566).[19] With more than $1.017 billion in allocated BEAD funding in 2023, Alaska also has the highest allocated BEAD funding cost per unserved or underserved BSL: $9,635.11. The state's unserved and underserved BSLs are up against great challenges due to extreme terrain, permafrost, and sparseness of population, leading to long-haul fiber buildouts. The challenges to BEAD implementation identified in the state's five-year BEAD plan include: geographic size and distance; low population communities; topography; existing assets and infrastructure; land ownership, land and water designations, culturally sensitive or significant areas; other program funding/projects; climate; access and transportation; permitting; workforce availability; and communication (specifically, real-time communications with individuals in remote areas is challenging due to a lack of available broadband, which may delay program implementation). An estimated 61% of all Alaskan land is federally owned, including agencies such as the Bureau of Land Management, the U.S. Fish and Wildlife Service, the National Park Service, the U.S. Forest Service, and the Department of Defense. An additional 24% of land is state-owned, and approximately 10.5% is privately held through the creation of over 200 regional and village corporations established through the Alaska Native Claims Settlement Act of 1971.[20] Thus, Alaska may face additional challenges in BEAD implementation due to the necessary coordination, communication, and consideration of the perspectives from such a large number of vested entities.

Michigan

According to its five-year BEAD action plan, the state of Michigan has 4,027,591 BSLs across its over more than 10 million residents in 83 counties.[21,22] Of those, 368,388 meet the definition of unserved (9.1% of all BSLs) and 123,935 meet the definition of underserved (3.1%), or a total of 492,323 prioritized BSLs (12.2%).[22] In 2023, Michigan was allocated more than $1.559 billion in BEAD funding[23], or $3,167.36 in allocated funds per unserved or underserved BSL (i.e., allocated funds per passing). Statewide, the Michigan High-Speed Internet Office identified the following barriers to BEAD Program implementation: legislative and regulatory barriers; workforce; supply chain and materials; local capacity; topography and geography (including rural terrain), Great Lakes (which necessitate installation of underwater fiber, which in

turn incurs additional costs related to installation and maintenance[24,25]), remote areas, winter weather, environmental concerns, and remote islands); procurement, contracting, and industry participation; and knowledge and communications.[22] Overall, the main challenges across the TBP target counties (Gladwin, Manistee, Missaukee, Montmorency, Osceola, and Oscoda) include the deployment of broadband infrastructure, ensuring that speed tests meet the expected download speeds, managing barriers related to affordability and adoption, and identifying assets that contribute to successful broadband deployment.

Texas

As the second largest state by area (over 261,000 square miles) and the second largest state by population (over 29 million people), Texas is a large state by any definition. Across its 254 counties, Texas has identified 9,877,083 BSLs.[26] According to their five-year action plan, the Texas State Broadband Office reports that 7.9% of these BSLs are unserved (779,378) and 3.7% of these BSLs are underserved (362,878).[26] In 2023, Texas was allocated over $3.3 billion in BEAD funding[23]—the most given to any state or U.S. territory—or $2,900.06 per unserved or underserved BSL (i.e., allocated funds per passing).[27] These allocated funds per passing is the lowest of any TBP target state, and this large number of underserved and unserved households (a combined 1,142,256 BSLs, or 11.6% of all BSLs statewide) adds complexity to the project.[26] The barriers to BEAD Program implementation anticipated by the Texas Broadband Development Office include: commercial sustainability, topography, incomplete or inaccurate availability data, workforce and labor, permitting and regulations, organizational capacity, affordability, digital literacy, access (e.g., a lack of publicly-available access points, a lack of ISPs currently offering service in some communities), letters of credit, matching funds, and taxable income.[26]

West Virginia

West Virginia has a much smaller population of only 1,793,716 residents,[28] and a smaller number of total BSLs at 900,407.[29] However, it boasts a high relatively percentage of unserved BSLs: 15.6%, or 140,334 BSLs. An additional 27,631 BSLs were identified as underserved, yielding a total number of unserved or underserved BSLs across the state of 167,965 or 18.7% of all statewide BSLs. West Virginia received $1.21 billion in its BEAD funding allocation, which is $7,208.65 per unserved or underserved BSL (i.e., allocated funds per passing). According to the state's BEAD initial proposal (volume 2), these unserved and underserved BSLs reflect the pre-BEAD state of unserved and underserved BSLs without a funding allocation. An additional 149,262 BSLs are also unserved or underserved, but have additional, pre-BEAD funding available to deliver broadband service to these locations. However, implementation challenges still remain for these additional BSLs, and the combination of both BEAD and non-BEAD allocated unserved and underserved BSLs is closer to 35.2% of all BSLs, any of which may experience challenges over the course of BEAD implementation and other program implementation in the next few years. According to West Virginia's initial BEAD proposal, the state faces many challenges to broadband expansion, including legislative and regulatory barriers, labor shortages, supply chain issues, materials availability, industry participation, lack of local digital inclusion programs and expertise, topography, digital literacy, and procurement/contracting issues.[29]

Discussion

The four TBP states received some of the highest BEAD Program funding allocations, with Texas receiving the greatest number of funds for any U.S. state or territory and the other TBP states all ranking among the top 50%: Michigan (4th), West Virginia (11th), and Alaska (19th). This order reverses when examining allocated cost per unserved or unserved BSL: Alaska, $9,635.11; West Virginia, $7,208.65; Michigan, $3,167.36; and Texas, $2,900.06. An examination of the state-level BEAD five-year-action plans revealed several common anticipated implementation challenges, such as regulatory barriers, low digital literacy among residents, workforce and labor issues, geography and topography challenges, and possible delays due to climate and inclement weather. Both Alaska and Michigan must contend with possible challenges due to underwater installation of fiber, which is more costly to install and repair. Both states have mentioned consideration of non-fiber solutions to increase broadband access, but some of those solutions (e.g., geostationary satellite technology) present their own challenges (e.g., slow latency, weather-related disruptions) and may provide connections that may not meet the 100/20/100 threshold for a served BSL. Some challenges are unique to individual states, such as the need for input and consensus among many entities with land jurisdiction across the state, including multiple federal agencies as well as the more than 200 regional and village corporations established through the Alaska Native Claims Settlement Act of 1971. Although the goal of BEAD funding implementation in each TBP state is the same (i.e., to bring broadband to everyone through the U.S. and its territories), the method to achieve this goal will necessarily vary from state to state based on the specific challenges identified by state broadband offices.

The FCC in collaboration with many stakeholders has created an incredible resource in the BSL Fabric to identify all BSLs with and without broadband access. However, an additional consideration for state broadband offices as they implement their BEAD plans and work to deliver broadband to all residents across all counties is that the user experience of broadband at a particular BSL may not be static. Analysis of direct broadband measurements from the 25 target counties across the 4 TBP Program states has revealed that broadband quality as measured by download speed, upload speed, and latency varies at individual BSLs across time. For example, a user connecting to broadband at a “served” BSL may experience points in time when their connections fall below the 100/20/100 threshold. (See the white paper, *Broadband capacity in rural communities: Results from the Telehealth Broadband Pilot (TBP) Pilot Program* for more detail.) This can be due to a wide variety of reasons, including issues related to the network, such as weather-related issues or other outages. However, they may also be due to issues at the individual BSL, such as building material density, number of users accessing the connection, or issues related to outdated hardware or software. Just as several BEAD plans recognized low digital literacy as a challenge to BEAD implementation, there are also technical connection challenges at the level of an individual or BSL. The BEAD Program’s emphasis on infrastructure investment is a key step in achieving the goal of ensuring broadband access to all residents. However, additional efforts will be needed to address challenges that may remain to ensure that all U.S. residents have consistent access to broadband.

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