BEAD Program: A Framework to Allocate Funding for Broadband Availability

National Overview

September 28, 2022

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A Letter from Grant Spellmeyer, President and CEO, ACA Connects

Dear State Broadband Leaders,

The Broadband Equity, Access, and Deployment (BEAD) program holds out tremendous opportunity to close the broadband availability and adoption gaps, and ACA Connects and its Members are eager to support you in achieving those objectives. Building on the positive efforts of the National Telecommunications and Information Administrative, we have worked with the business consulting firm Cartesian to develop a framework for how you might spend your allocation of BEAD funds on deployment projects – estimating the unserved and underserved locations in your State/Territory based on the latest FCC data and our own methodology, applying the funding allocation formula in the BEAD statute, and then running scenarios on spending your funds to bring service to all eligible locations, first using fiber, as the Notice of Funding Opportunity (NOFO) requires, and then with other broadband network technologies. After you have reviewed our analysis, please let ACA Connects or its Members (who are identified in this presentation) know if you have any questions or require further information.

Thank you.

Grant Spellmeyer

Source: Cartesian

Overview | A Framework to Allocate BEAD Funding for Broadband Availability

The goal of the BEAD Program is universal broadband availability

- To close the availability gap, BEAD provides States/Territories with $42B

States/Territories can gain insight today on available funds and expected deployment costs to prepare their Action Plans and funding proposals

- Before the FCC Broadband DATA Maps are finalized, we can estimate the amount of funding each State/Territory will receive, the provider match, and the cost to deploy to eligible locations
- We estimate that in 2023 (when funds are allocated), approximately 11.7M locations in the U.S. will be unserved or underserved; through ongoing builds, this number decreases to 10.9M in 2024 (when awards are made)
- We estimate that fiber providers will be willing to match up to $2,500/location and that the overall provider match will add another $25B of funds – for a total of $67B in capital available for availability projects

Our analysis indicates that funding is sufficient to achieve the program's availability goal

- We find that $67B in funding should be sufficient to make broadband service available to all eligible locations
- Most states/Territories should have sufficient funds to deploy fiber – the NOFO's preferred technology – to all unserved and underserved locations below a reasonable "extremely high-cost threshold" and use other technologies to serve the remaining locations, with the majority of States/Territories expected to have funds left over for affordability and other eligible programs
- States/Territories also may choose to achieve "maximum fiber" availability by using additional funds

Source: Cartesian

Our National-Level Approach | Estimate Funding & Model Availability Impact

1 Estimate Eligible Locations

How many unserved and underserved locations will determine BEAD funding?

We start with the most recent FCC Form 477 data to estimate unserved/underserved locations, then make several adjustments:

- **Areas with Other Support Programs:** We remove “committed” locations covered by the FCC’s RDOF/ROR programs
- **Unserved Locations in Partially Served Census Blocks:** Because Form 477 systematically overstates broadband coverage, we estimate and include additional unserved locations
- **Incremental Builds:** We estimate and include additional, post-June 2021 private sector and government deployments

2 Calculate BEAD Funding

How much funding is each State/Territory estimated to receive?

Using our estimates of eligible locations and our deployment cost model, we calculate State/Territory-level funding specified by the BEAD statute:

- **Minimum Initial Allocation:** States/Territories receive $100M or $25M, respectively
- **High-Cost Allocation:** Funds are allocated in proportion to the estimated State/Territory’s national share of high-cost unserved locations
- **Remaining Funds Allocation:** Funds are allocated to each State/Territory in proportion to their share of unserved locations

3 Develop Deployment Scenarios

How many locations can be covered with fiber and other technologies?

Using BEAD Funding + the Provider Match, we run two scenarios to estimate how many locations can receive high-speed broadband with fiber and other technologies:

Baseline Fiber to Unserved Locations: Satisfying the NOFO’s fiber preference, fiber is deployed to unserved locations up to a reasonable estimate of the extremely high-cost threshold; remaining eligible locations are covered with fiber and other technologies

Maximize Total Fiber Locations: Maximize fiber availability to all eligible locations with support above the threshold, leaving enough funding to deploy other technologies to remaining locations

Source: Cartesian

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Methodology | Our Estimate of Eligible Locations

Estimates are adjusted based on partially served blocks, support programs, and estimated incremental build

June 2021 Form 477 Serviceability	We start with the most recent census block serviceability estimates from the FCC
Baseline Location Estimates[1]	US household and business locations are overlaid onto each census block
+ **Unserved Locations in Partially Served Census Blocks**	Form 477 systematically overstates broadband coverage – additional unserved locations in partially served census blocks are estimated and added using a study from BroadbandNow
– **Locations in Existing Subsidy Funded Programs[2]**	Locations in census blocks with “commitments” to receive support from Rate of Return and RDOF programs are removed
– **Incremental Builds**	We estimate a reduction in unserved locations from incremental private sector and government funded builds based on the 13% rate observed in Form 477 data from June 2020 to June 2021
= **Estimated Eligible Locations[3]**	Our estimate of eligible locations that will need to be addressed in the BEAD program

1. Household estimates are Census Bureau census block level housing unit estimates for 2020. Business locations and associated latitude/longitude from Dun & Bradstreet data are geo-mapped to census blocks for census block level business counts.
2. RDOF awards exclude Starlink and LTD locations. RDOF bids in default (~130K locations). Locations funded by ARPA/CARES and other “commitments” are not excluded in our analysis; thus, the number of eligible unserved and underserved locations are overstated by these amounts.
3. Given the uncertainty around the magnitude of underreported areas vs. recent builds and locations moving from unserved to underserved, we have not made partially served and incremental builds adjustments to underserved locations.

Source: Cartesian, FCC Form 477 (June 2021), Dun & Bradstreet, BroadbandNow, Census Bureau

1 Estimate Eligible Locations

Eligible Locations Verification | Form 477/Georgia Comparison

Comparison of Form 477 and Georgia Broadband Map

- The Georgia Broadband Map provides a location-based map that shows broadband availability to every home and business in the State
- The Georgia Broadband Map initiative allows us to compare the expected number of unserved locations in partially served census blocks
- We found that the BroadbandNow study – which estimates how much the FCC Form 477 underreports unserved locations on a State level – is consistent with the Georgia Broadband Map, providing support to use the Partially Served Multiplier to estimate true unserved locations

Total Locations	Form 477 Georgia (June 2021)	Georgia Broadband Map (June 2022)
	5,531,885	5,381,448
Unserved Locations (less than 25/3 speeds)	191,993	467,270
Partially Served Multiplier	2.9X	N/A
Adj. Unserved Locations	558,915	N/A
Incremental Build (13% annual build, for 12 months)	72,659	N/A
Estimated Unserved	486,256	467,270
% of Unserved Locations	8.8%	8.7%

This comparison provides confidence that our national broadband study gives a sufficiently accurate estimate of unserved locations

Source: Cartesian, FCC Form 477 (June 2021), Dun & Bradstreet, BroadbandNow, Census Bureau, Georgia Broadband Map

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1 Estimate Eligible Locations

National Summary | Estimated Eligible Locations

June 2021 Form 477 Locations	Unserved (less than 25Mbps/3Mbps)	Underserved[1] (less than 100Mbps/20Mbps)
	3.3M	**7.1M**
Partially Served Multiplier	3.0X	--
Adj. Form 477 Locations	**9.9M**	**7.1M**
Subsidy Program Funded Locations	1.5M	2.2M
Adj. Unserved Locations	**8.4M**	**4.9M**
Incremental Build (13% annual build, for 18 months)	1.6M	--
Jan. 2023 Estimated Eligible Locations	**6.8M**	**4.9M**
Incremental Build (13% annual build, for 12 months)	0.9M	--
Jan. 2024 Estimated Eligible Locations	**5.9M**	**4.9M**

BEAD Funding Eligible Locations

6.8M unserved locations are used to estimate BEAD funding eligibility for each State/Territory. Underserved locations are addressed in availability scenarios but are not factored into funding estimates

BEAD Eligible Locations Requiring Support

We estimate 10.9M total eligible locations could be addressed through BEAD funding:

5.9M Jan. 2024 Estimated Unserved + **4.9M** Jan. 2024 Estimated Underserved

1. Given the uncertainty around the magnitude of underreported areas vs. recent builds and locations moving from unserved to underserved, we have not made partially served and incremental builds adjustments to underserved locations

Source: Cartesian, FCC Form 477 (June 2021), Dun & Bradstreet, BroadbandNow, Census Bureau

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2 Calculate BEAD Funding

National Summary | BEAD Funding Formula

Statutory Requirements

1 Funding Allocation:

State/Territory BEAD Funding allocations will be determined using the –

(1) Minimum Allocation,

(2) High-Cost Allocation, and

(3) Remaining Funds Allocation

2 Provider Match:

Providers must match at least 25% of project costs, except if the location is within a high-cost area or if States / Territories choose to permit a lower match

States/Territories will share $42B in funding

Minimum Allocation: $5.3B

$100M FOR STATES OR **$25M** FOR TERRITORIES

+

High-Cost Allocation: $4.2B

Allocated to States/Territories based on share of high-cost, unserved locations

10% OF PROGRAM FUNDS

+

Remaining Funds Allocation: $33B

Allocated to each State/Territory based on share of unserved locations

=

Total BEAD Funds: **$42B**

Methodology

High-Cost Allocation:

10% of BEAD funding is reserved to reach the highest-cost households. Our proprietary cost model ranks the highest cost census tracts to serve and allocates funds to states based on their share of the high-cost households

Remaining Funds Allocation:

After deploying the minimum allocation and the high-cost allocation, the remaining funds are distributed to States/Territories based on their share of unserved locations

Source: Cartesian

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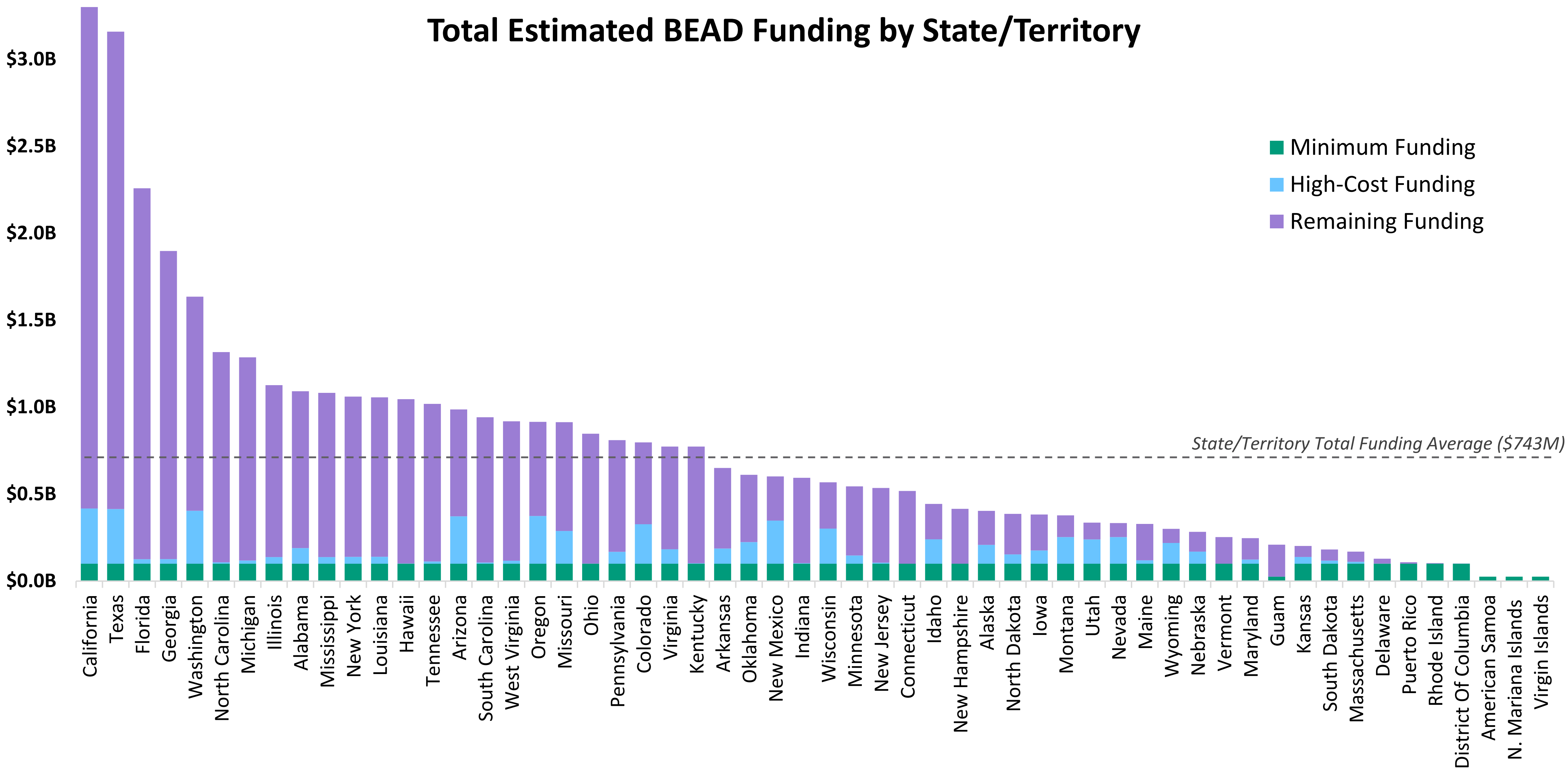
2 Calculate BEAD Funding

National Summary | Estimated BEAD Funding Distribution



Source: Cartesian, FCC Form 477 (June 2021), Dun & Bradstreet, BroadbandNow, Census Bureau, Benton

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2 Calculate BEAD Funding

Provider Match Funding & Setting the High-Cost Threshold

We assume a maximum provider match of $2.5k which supports a payback period of ~5 years; setting the extremely high-cost per location threshold at $7.5k is consistent with a $2.5k match (25% of total project cost)

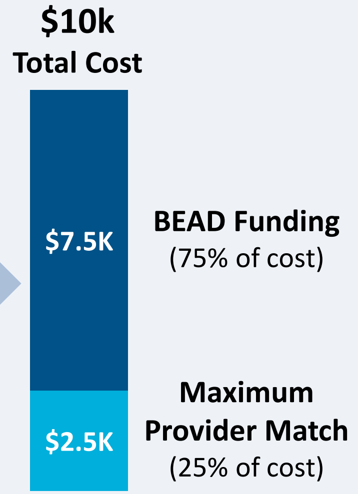
Provider Economics Per Location

Annual Customer Spend ($64/month[1])	**$768**
× **Adoption Rate[2]**	**70%**
× **Average Margin[3]**	**90%**
= **Annual Contribution**	**$484**

Assumed Match	**$2,500** (maximum)
÷ **Annual Contribution**	**$484**
= **Payback Period**	**5.2 years**

Setting the Extremely High-Cost Threshold

- Each State/Territory must set an extremely high-cost per location threshold – the point at which other technologies *may* be considered if less expensive
- For our analysis, we have chosen a **$7.5k** threshold which is consistent with a **$2.5k** maximum provider match (25% match requirement)
- Provider match has a maximum of 75% up to $2.5k:
  - At the 7.5k threshold, provider match is at the minimum of 25%
  - Beyond the threshold, provider match scales down and can be below 25% for locations in high-cost (unserved) areas
  - The extremely high-cost threshold is set above the point at which locations are considered "high-cost" in our analysis. We assume that match waivers are applied for underserved areas costing more than $10K



- For locations above the threshold, States/Territories may choose to reduce the 25% provider match and deploy fiber rather than using other technologies
- If States/Territories set the extremely high-cost threshold too low, fiber will not be adequately prioritized and communities that would otherwise have received fiber will miss out
- If States/Territories set the extremely high-cost threshold too high, providers will be unable to meet the 25% match amount for more costly locations, which will result in a lack of bids for locations in those communities

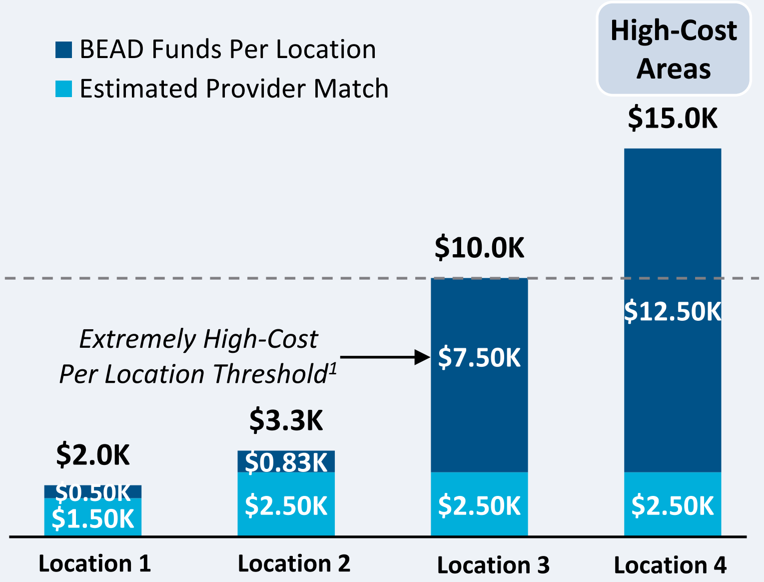
1. Blended ARPU based on $70 per month for broadband services (based on the New America 2020 report) with 15% of customers on a $30 low-cost plan
2. Since it is not likely that all locations will adopt broadband, we assume an 70% adoption rate, based on a Connected Nation 2020 study on internet adoption rates overtime
3. We assume the average margin based on 2021 NextTV Broadcasting+Cable article on broadband service margins

Source: Cartesian, New America, Connected Nation, NextTV

National Summary | Estimated BEAD Funding & Provider Match

Provider Match Examples

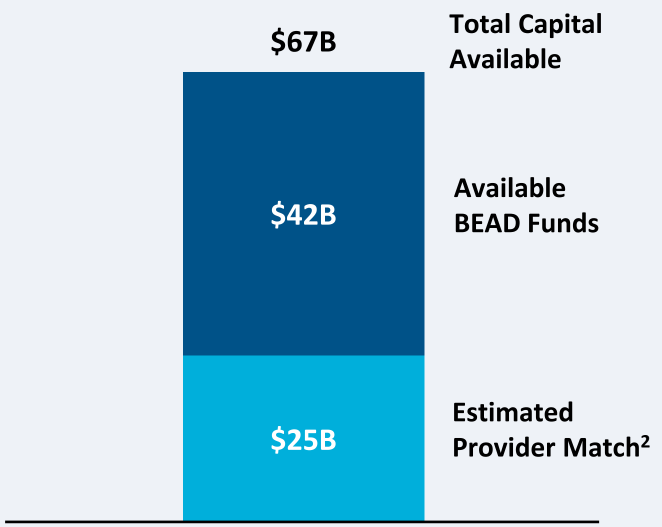
Total Deployment Cost per Location



Provider Match %			
75%	75%	25%	17%

To be conservative, we assume provider match amounts have a maximum of 75% and a minimum of 25%, except in high-cost areas

Total Capital Available - Nationally



$67B in total capital is estimated to be available to serve unserved/underserved locations (using both BEAD funding and provider match amounts)

Provider Match - Nationally

Total Estimated Provider Match: $25B

÷ **Total Estimated Eligible Locations:** 10.9M

= **Average Provider Match:** $2,294 *PER LOCATION*

We estimate the average provider match will be $2,294 – provider matches will be 75% where cost to deploy is less than $3.3K

1. The model uses a $7.5k threshold, however, States/Territories will individually need to determine their appropriate extremely high-cost threshold
2. Assumed maximum $2.5K provider match also applies to locations deployed with FWA/other technologies. In reality, providers will determine the viable level of match funding for each project using a business case model. They will be willing to contribute a greater match in some locations and less in others. Locations that are hardest to serve may need to be fully funded by BEAD with no match. Competitive bidding should drive provider matches towards this level.

Source: Cartesian, FCC Form 477 (June 2021), Dun & Bradstreet, BroadbandNow, Census Bureau, Benton

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3 Develop Deployment Scenarios

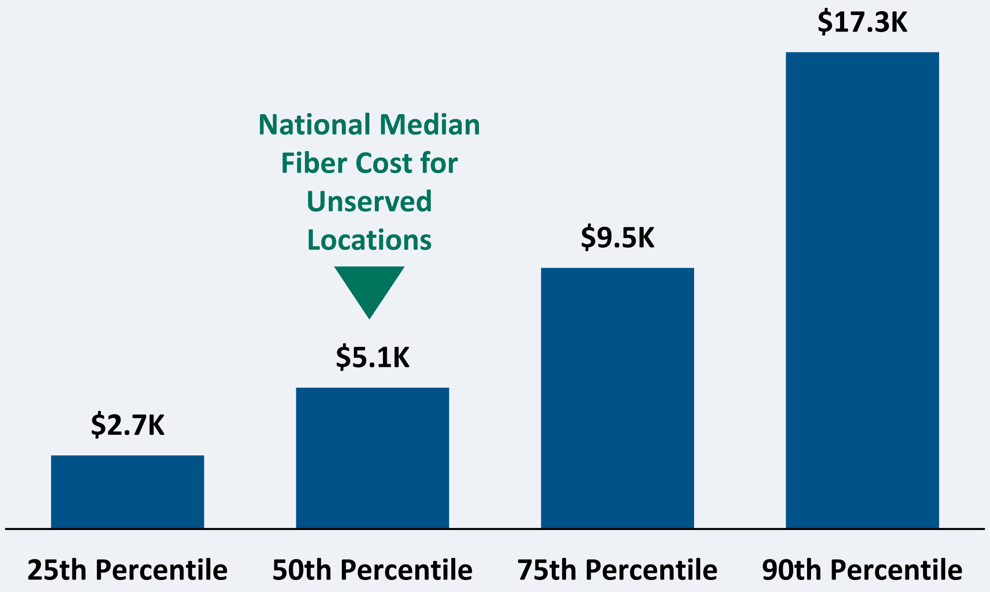
National Summary | Key Assumptions

Assumption	Description	
High-Cost Threshold[1]	Funding threshold for fiber per location, above which States/Territories *may* consider other technologies	$7.5K PER LOCATION
Alternate Technology[2]	For locations above the extremely high-cost threshold, we assume fixed wireless will be used and apply a uniform cost per location	$4K PER LOCATION
Partially Served Location Cost	Partially served locations are assumed to cost the national median fiber cost for unserved locations	$5.1K PER LOCATION
Provider Match Maximum[3]	Assumed maximum amount that providers will contribute per location to achieve a positive business case; this reflects the high-end cost of private build	$2.5K PER LOCATION
Fiber Cost Model	Leveraging our proprietary network cost model, the model considers networks, distances between locations and equipment to estimate average cost per location for each census tract. The model does not examine middle mile infrastructure.	

Setting the Partially Served Location Cost

For partially served locations, we assume a cost of **$5.1k** based on the national median cost for unserved locations

Unserved Cost Profiles by Decile



1. The model uses a $7.5k threshold, however, States/Territories will individually need to determine their appropriate extremely high-cost threshold
2. We assume FWA locations to cost $4K per location based on a 2022 Benton study, stating a cost estimate of $4K per location in very low-density rural areas for FWA network using beamforming and massive MIMO at 5GHz with a mix of indoor and outdoor CPE to achieve 100/20 Mbps
3. Assumed maximum $2.5K provider match also applies to locations deployed with FWA/other technologies. In reality, providers will determine the viable level of match funding for each project using a business case model. They will be willing to contribute a greater match in some locations and less in others. Locations which are hardest to serve may need to be fully funded by BEAD with no match. Competitive bidding should drive provider matches towards this level.

Source: Cartesian, FCC Form 477 (June 2021), Dun & Bradstreet, BroadbandNow, Census Bureau, Benton

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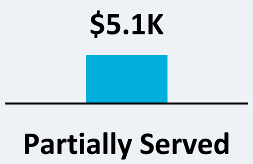
National Summary | Cost to Deploy Fiber by Location

CAPEX Fiber Deployment Cost per Location Segmented by Cost Deciles[1]

Unserved Locations

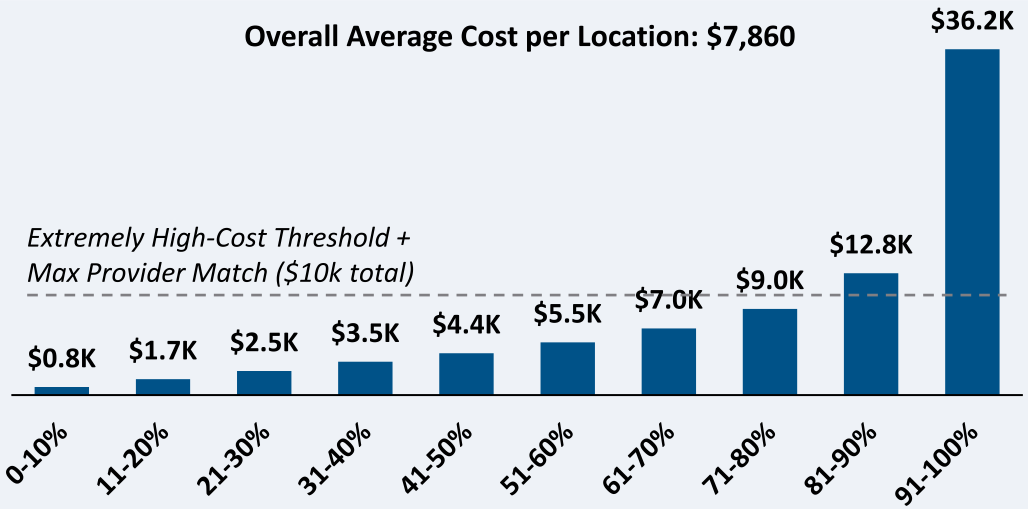
Partially Served CBs



4.6M Locations

Fully Unserved CBs

Overall Average Cost per Location: $7,860



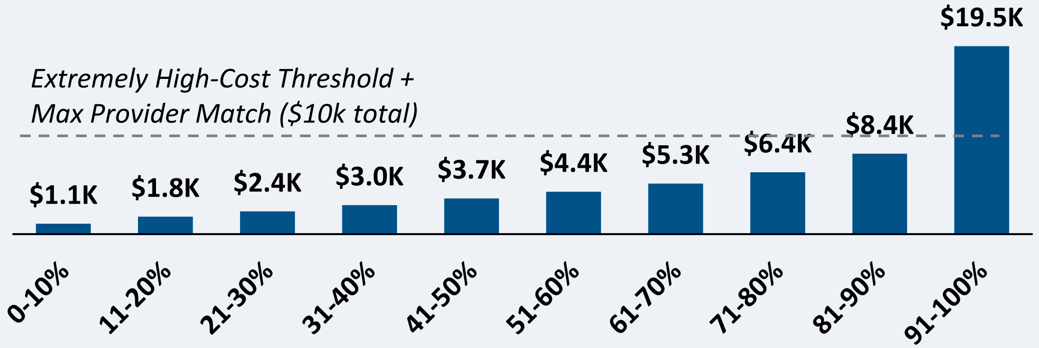
Average Tract Density *(Housing Unit per sq. Mile)*

0-10%	11-20%	21-30%	31-40%	41-50%	51-60%	61-70%	71-80%	81-90%	91-100%
25,663	3,933	4,187	1,019	1,339	345	227	146	44	8

1.3M Locations

Underserved Locations

Overall Average Cost per Location: $5,140



Average Tract Density *(Housing Unit per sq. Mile)*

0-10%	11-20%	21-30%	31-40%	41-50%	51-60%	61-70%	71-80%	81-90%	91-100%
9,705	2,206	3,463	745	676	805	256	188	145	32

4.9M Locations

Over 90% of locations are estimated to fall below the High-Cost Threshold + Provider Match

1. Chart values are average cost per location for each decile bucket

Source: Cartesian, FCC Form 477 (June 2021), Dun & Bradstreet, BroadbandNow, Census Bureau

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National Summary | Baseline Fiber vs. Maximum Fiber

$49B - $59B CAPEX Required to Deploy to All Eligible Locations

CAPEX Deployment Costs:

- **Fiber:** Below High-Cost Threshold
- **Fiber:** Above High-Cost Threshold
- **Fixed Wireless:** Above High-Cost Threshold

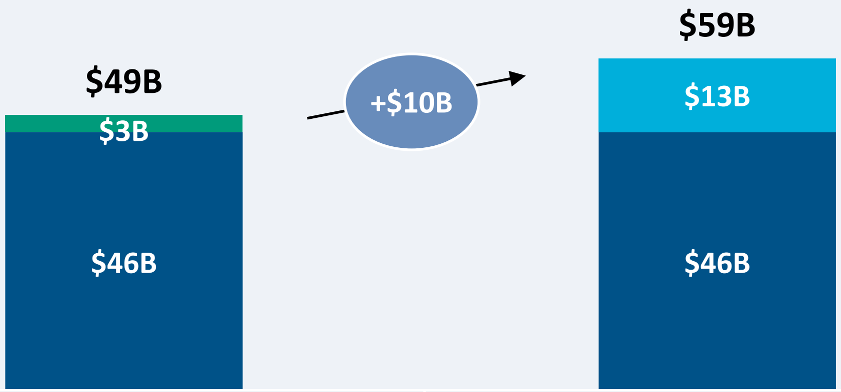
Baseline Fiber
Other Technology Above High-Cost Threshold

Deploy fiber to locations below high-cost threshold; then fixed wireless

Maximum Fiber
Fiber Above High-Cost Threshold

Deploy fiber to all locations above and below the high-cost threshold

Estimated National Deployment Cost for 10.9M Eligible Locations:



Cost per Location:	$4,145	$5,485
Low-Cost[1] Locations (*10.2M*):	$4,553	$4,553
High-Cost[2] Locations (*0.7M*):	$4,000	$18,165
Share of $67B Estimated Capital:	73%	88%

Key Takeaways

High-speed broadband can be deployed to all eligible locations for a cost of $49B:

- Assumes fiber below the extremely high-cost threshold, and fixed wireless above
- Represents ~70% of the estimated capital available with provider matches
- Provides an opportunity to use additional funds for affordability programs, which will vary by state

Deploying maximum fiber to eligible locations would require an incremental cost of $10B:

- Deploying fiber to the 0.7M locations above the high-cost threshold costs an average of $18K per location
- Incremental fiber coverage will reduce remaining funding

1. We assume partially served locations to cost the national average fiber cost of $5.1K per location
2. The extremely high-cost per location threshold is $7.5k. We assume that fixed wireless deployment for locations above this threshold costs $4K per location, based on the Benton 2022 study
3. On a national level, there is BEAD funding remaining from the $67B in total capital, however this might not be the case at a State/Territory-level since available funds and costs will vary for each State/Territory. BEAD grants for projects may be taxable to providers; however, we do not account for this in our analysis.

Source: Cartesian, FCC Form 477 (June 2021), Dun & Bradstreet, BroadbandNow, Census Bureau, Benton

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