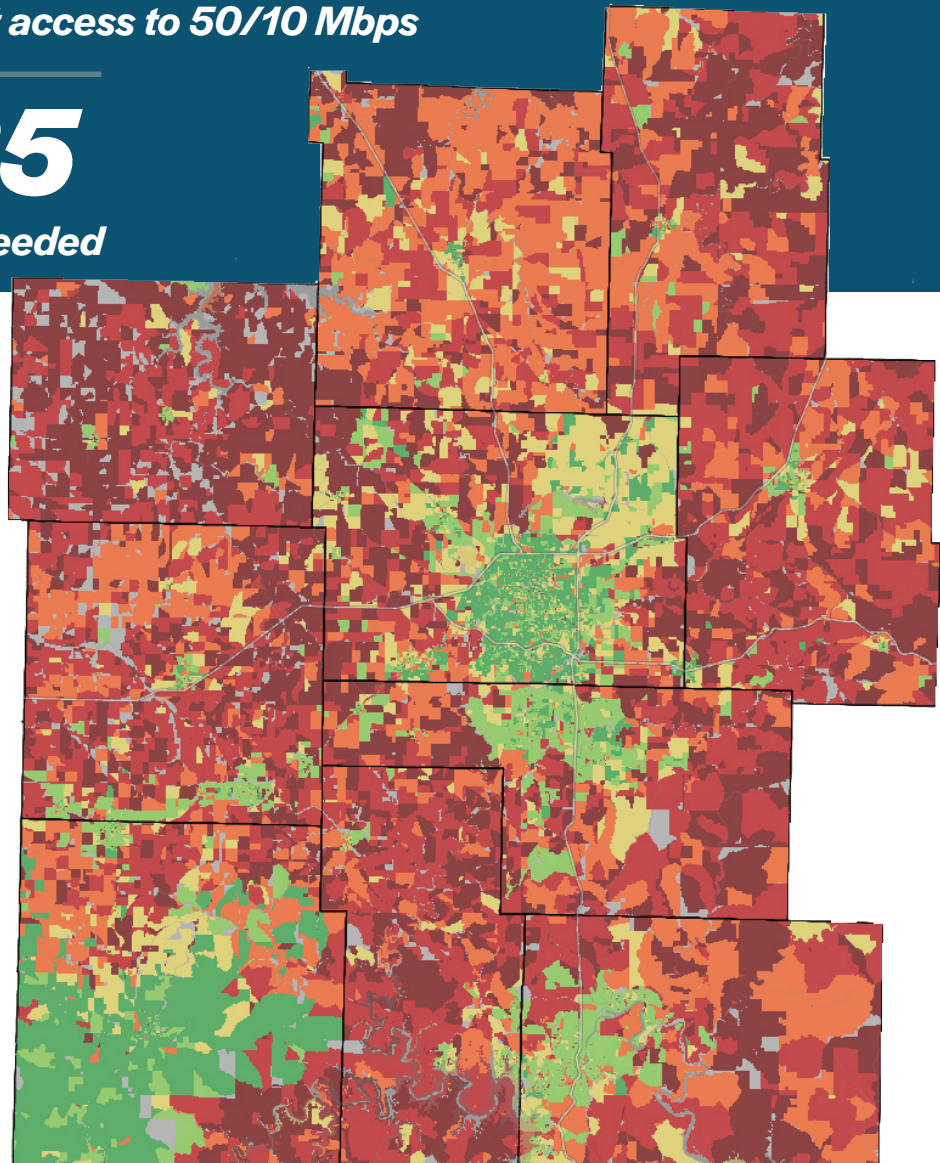


36% – 94,428

locations without access to 50/10 Mbps

9,335

miles of fiber needed



**Broadband Modeling and
Engineering Feasibility
Study**

Funded through a grant from the US Economic Development Administration (EDA), and the Missouri Department of Economic Development (DED) Community Development Block Grant Program (CDBG).

October 2023



- Below 10/1 Mbps ■ Above 10/1; Below 25/3 Mbps ■ Above 25/3; Below 50/10 Mbps ■ Above 50/10; Below 100/20 Mbps ■ Above 100/20; Below 200/50 Mbps ■ Above 200/50 Mbps
- null / no data

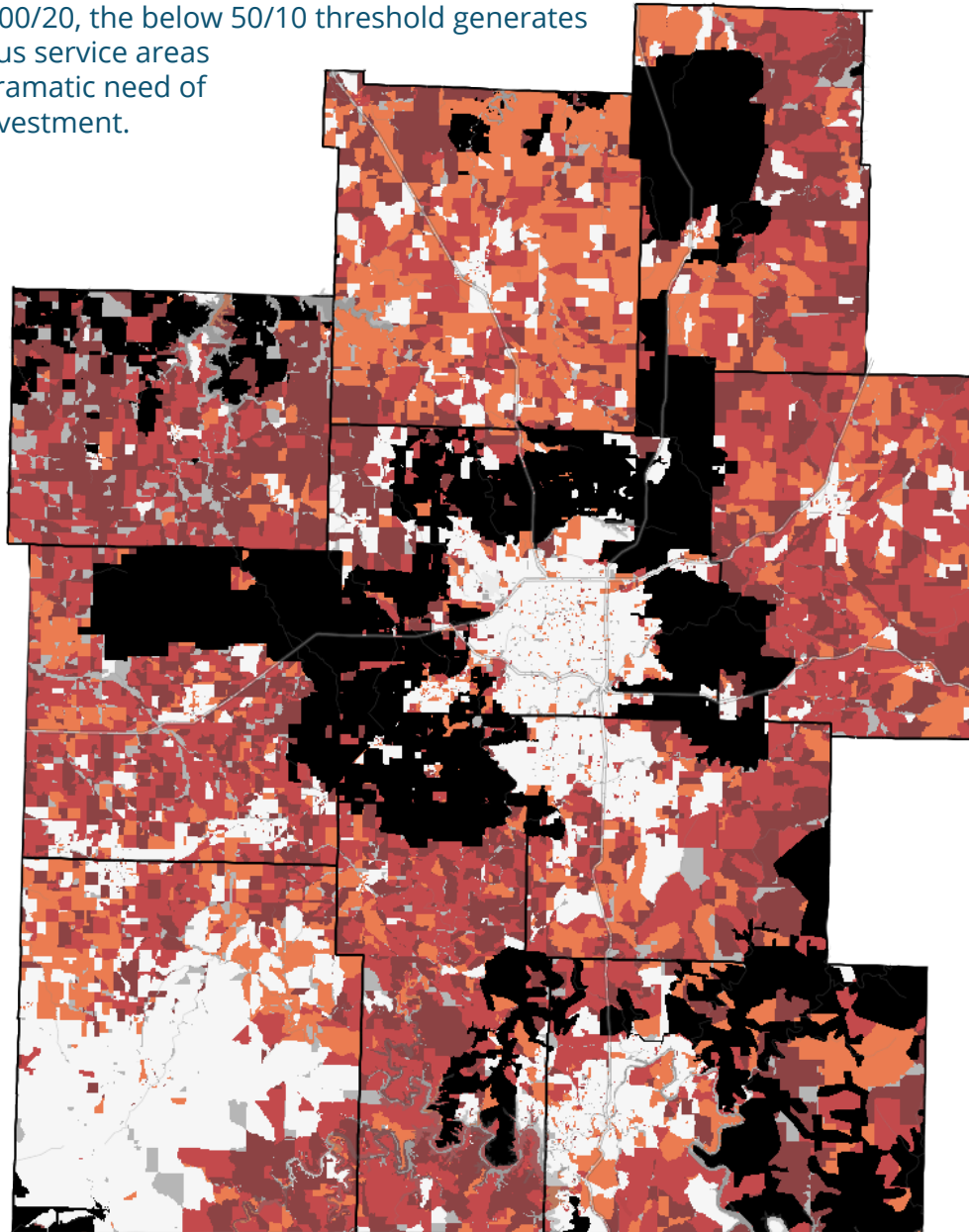
*Coverage ratings reflect multiple sources, including Ookla Speedtest Intelligence® data licensed by MACOG for the months of December 2020 through July 2023. See Appendix 1 for detailed methodology

FUNDED AREAS

The state of Missouri received federal funding from USDA ReConnect, The Rural Digital Opportunity Fund, and the NTIA. Additional funds from the state were awarded to providers from the Missouri Broadband CARES program, American Rescue Plan Act (ARPA), and the state broadband grant program.

Blocked out areas show existing federal and state awards that were not in default at the time of this report. The remaining areas in red and orange are below 25/3 and 50/10 Mbps respectively and were the areas of focus for the county cluster project planning.

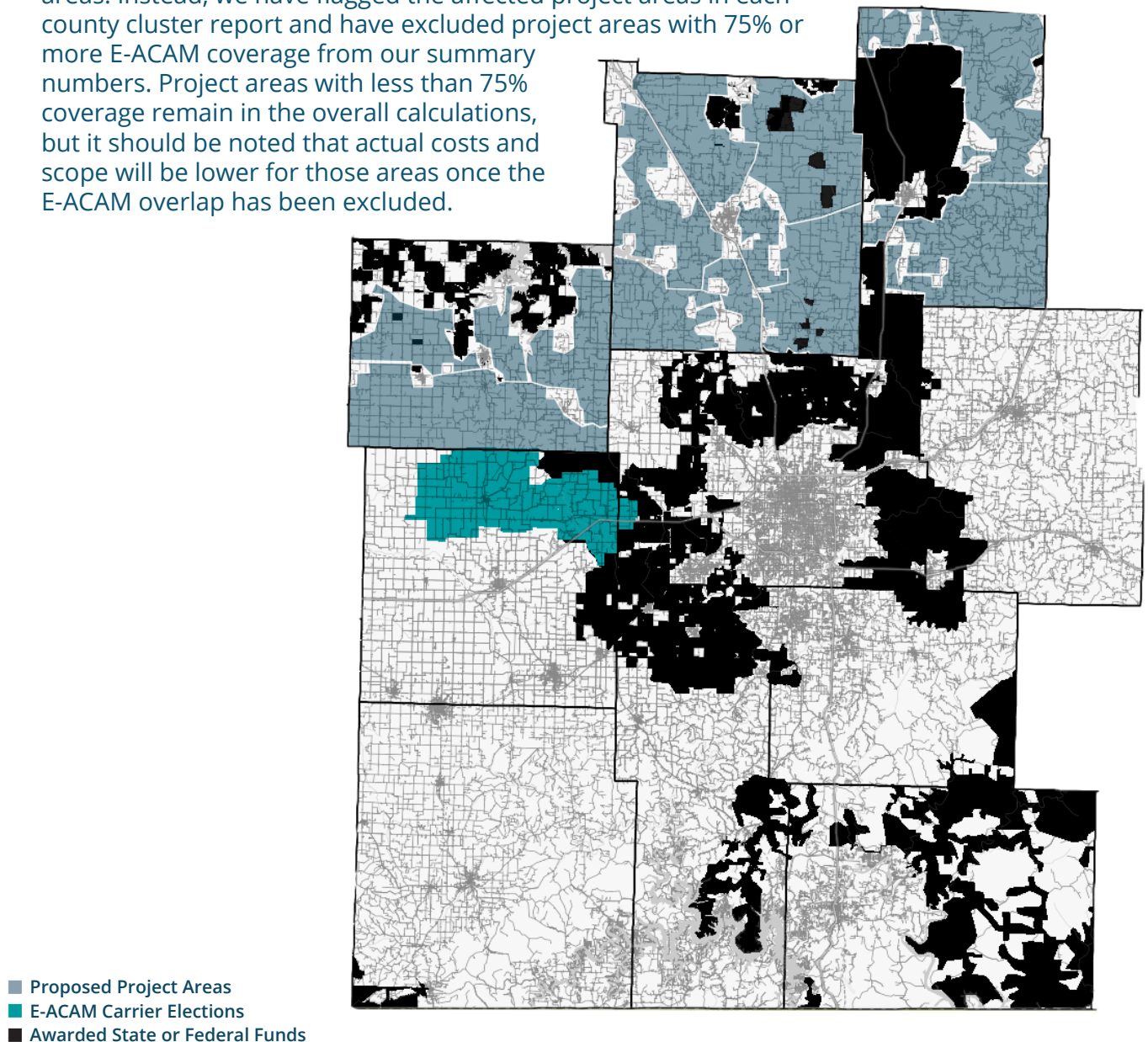
While the Federal definition of “underserved” applies to any location below 100/20, the below 50/10 threshold generates logical, contiguous service areas that remain in dramatic need of infrastructure investment.



- Below 10/1 Mbps
- Above 10/1; Below 25/3 Mbps
- Above 25/3; Below 50/10 Mbps
- Awarded State or Federal Funds
- null / no data

The FCC’s Connect America Model (CAM) is a long-standing subsidy program that pays telecommunications carriers to offer broadband in their landline telephone territories. The original model targeted 10/1 Mbps. The “alternative” model (ACAM) upped that to 25/3 Mbps. The most recent, “enhanced alternative” model (E-ACAM) offers additional subsidy to carriers who agree to increase speeds to 100/20 Mbps. By the late October 2023 deadline, several of the Missouri-based ACAM providers elected to accept the FCC’s E-ACAM offer. As such, these areas become ineligible for BEAD and most other sources of broadband grant funding.

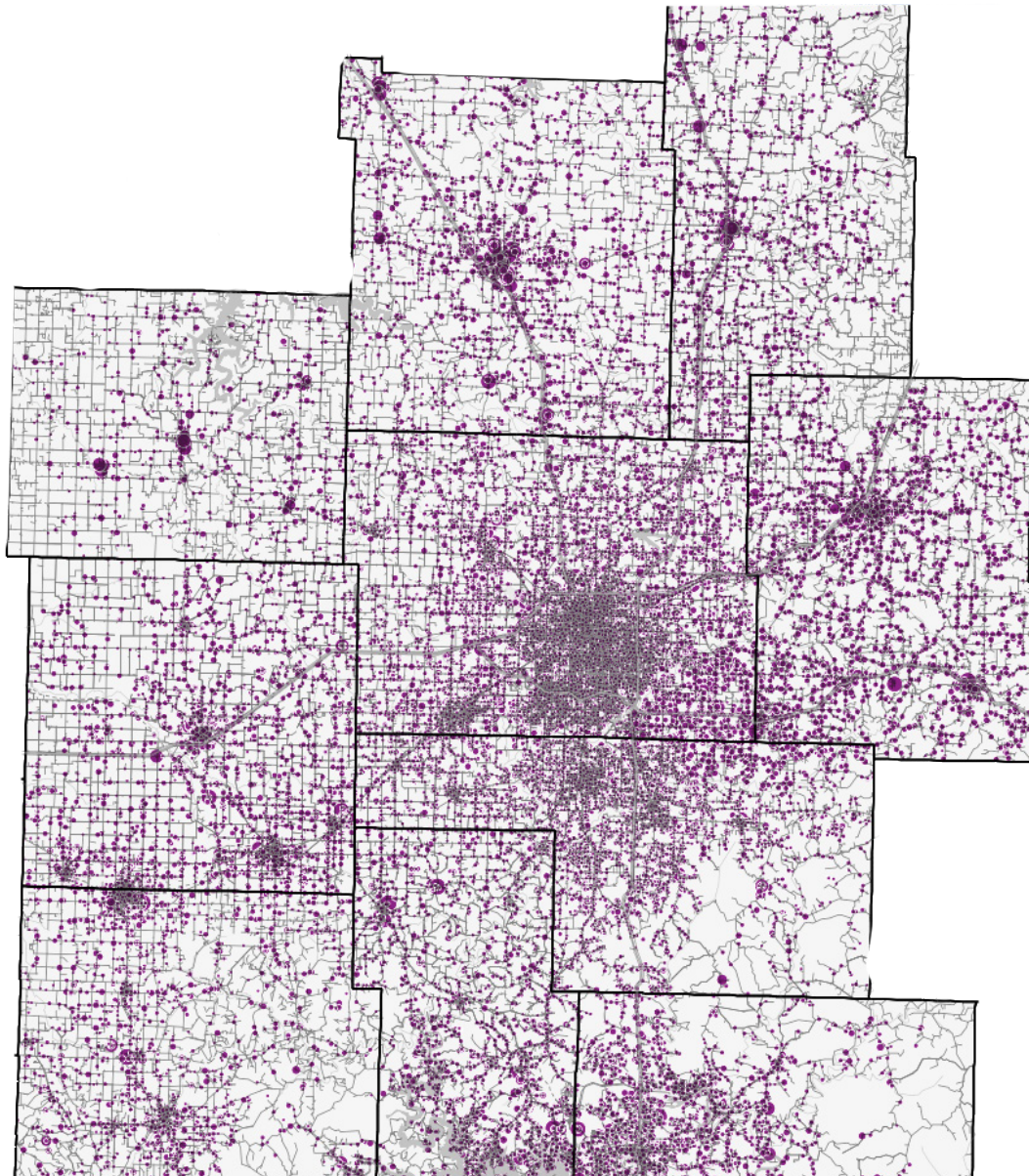
E-ACAM elections will affect 29 project areas in 13 cluster counties, including 10 project areas that have at least 75% of their total area covered by E-ACAM. Because this development came at the end of RCG’s period of performance, there was not enough time to redraw project boundaries and recalculate the financial estimates for those areas. Instead, we have flagged the affected project areas in each county cluster report and have excluded project areas with 75% or more E-ACAM coverage from our summary numbers. Project areas with less than 75% coverage remain in the overall calculations, but it should be noted that actual costs and scope will be lower for those areas once the E-ACAM overlap has been excluded.



BUSINESS OPPORTUNITY AREAS

Business demand for broadband varies based on company size and economic sector. The greater the demand, the bigger the dot. The presence of a high-demand business or multiple businesses of any size will make that area significantly more attractive to a broadband provider.

*See "Business Broadband Opportunity Index" in Appendix 1 for a detailed explanation of how dot size was determined

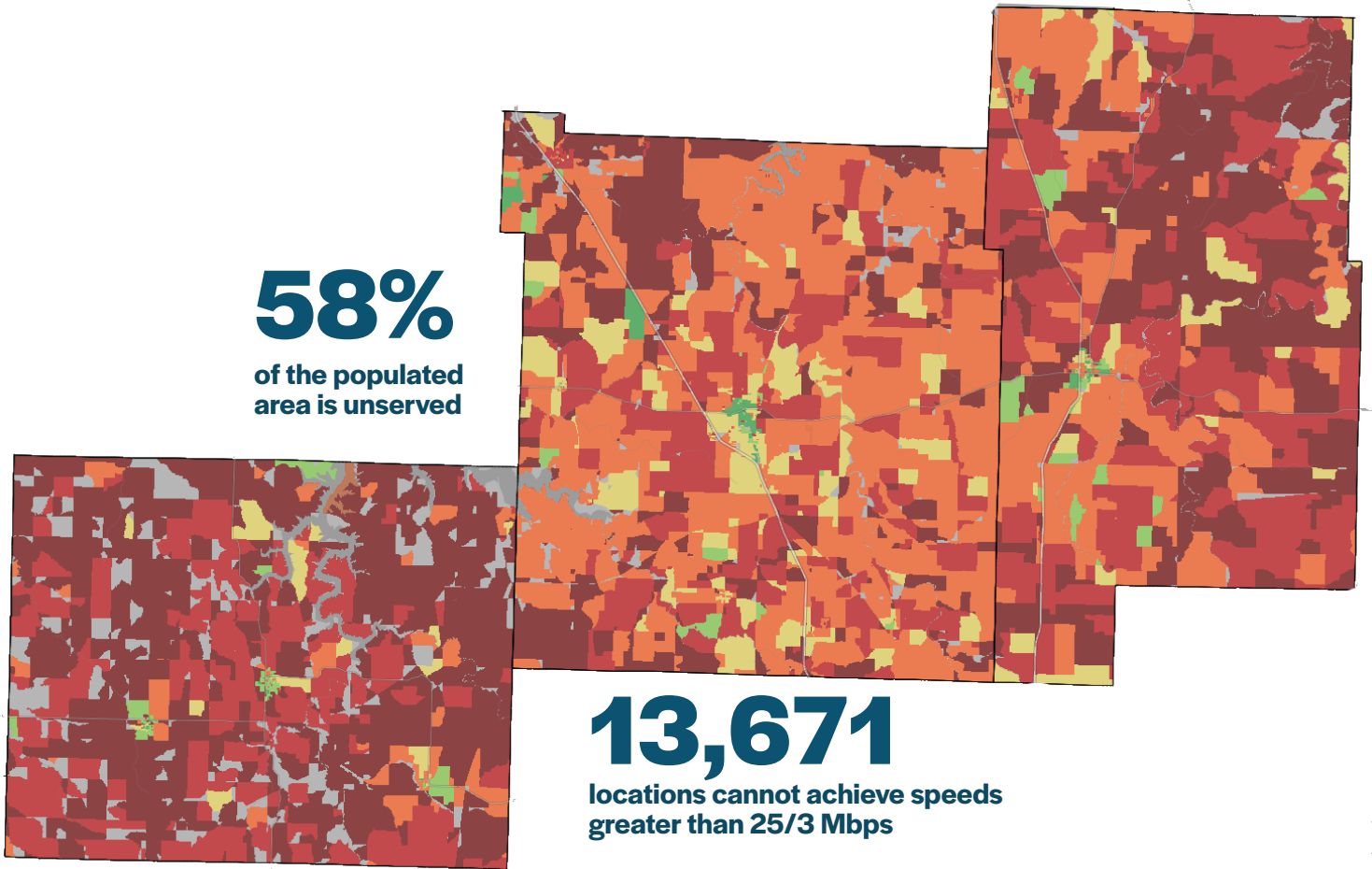


• • • Business Locations *[the larger the dot the greater the broadband demand]*

Dade / Polk / Dallas

Project Cluster - Southwest Missouri Council of Governments

58%
of the populated
area is unserved

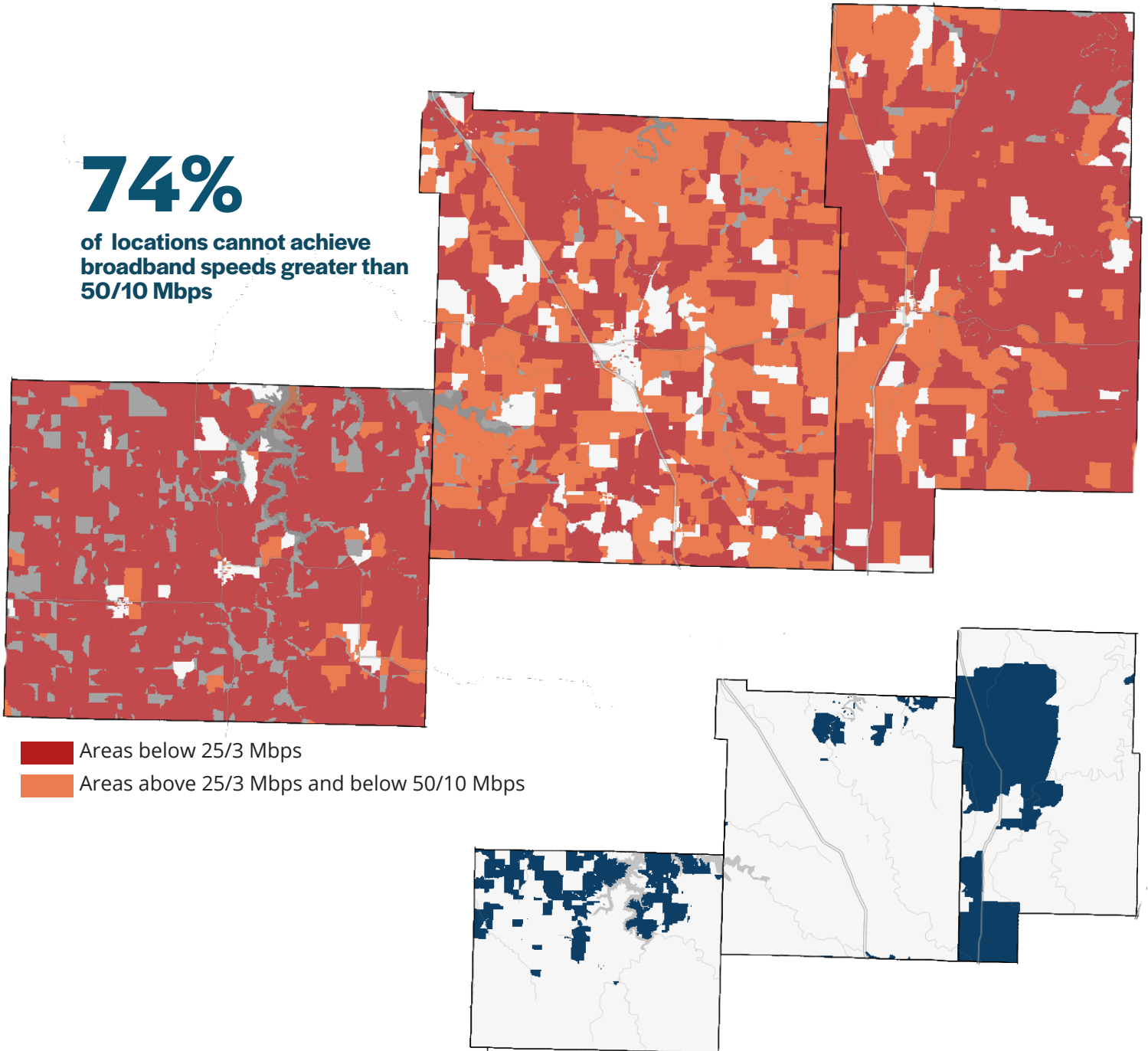


- Below 10/1 Mbps
- Above 10/1; Below 25/3 Mbps
- Above 25/3; Below 50/10 Mbps
- Above 50/10; Below 100/20 Mbps
- Above 100/20; Below 200/50 Mbps
- Above 200/50 Mbps
- null / no data

AREAS OF FOCUS

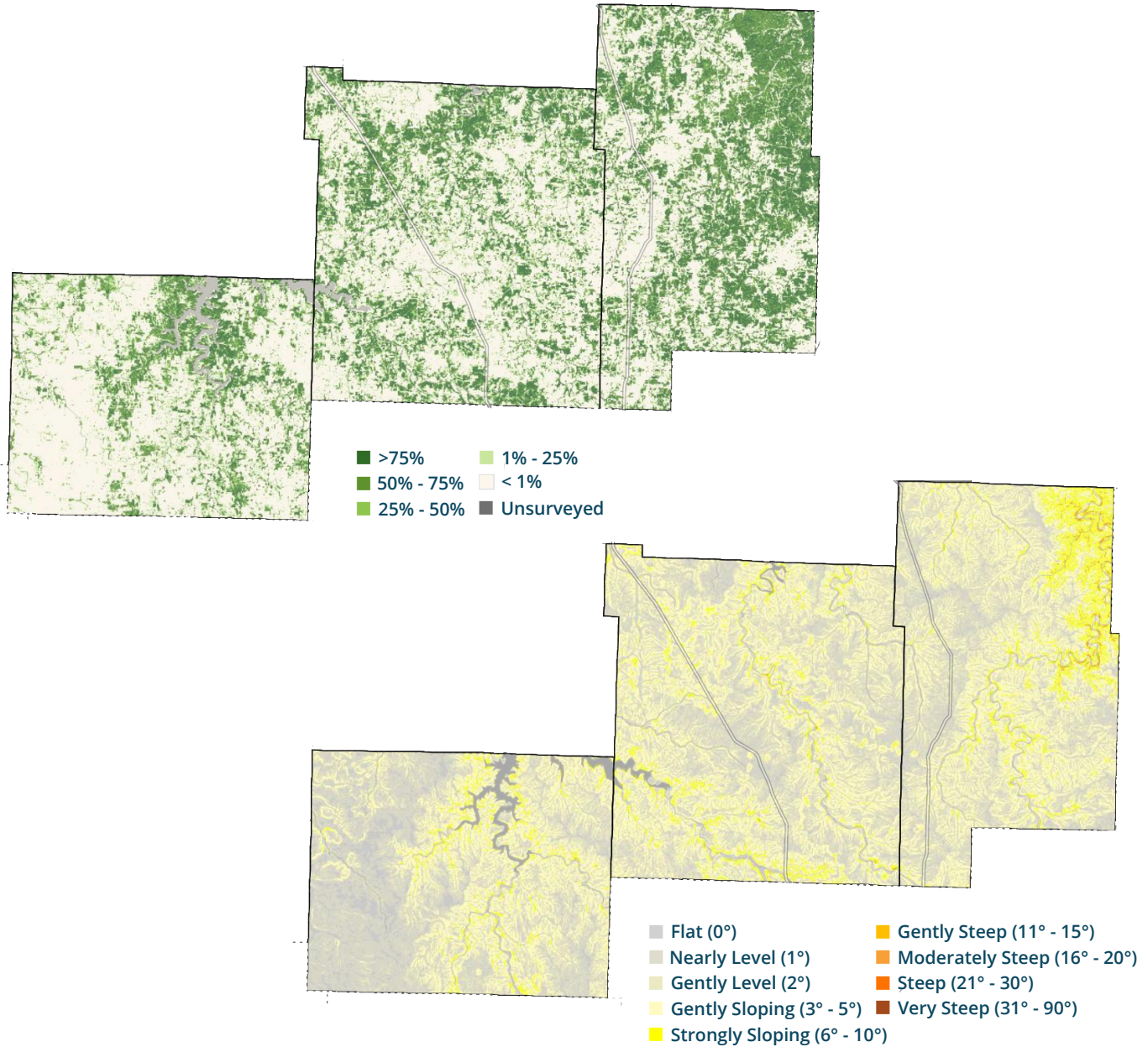
74%

of locations cannot achieve
broadband speeds greater than
50/10 Mbps



PLANNING CONSIDERATIONS

Rugged terrain and dense canopy cover can impact deployment costs, route considerations and technology options.



PROJECT AREAS

12,840

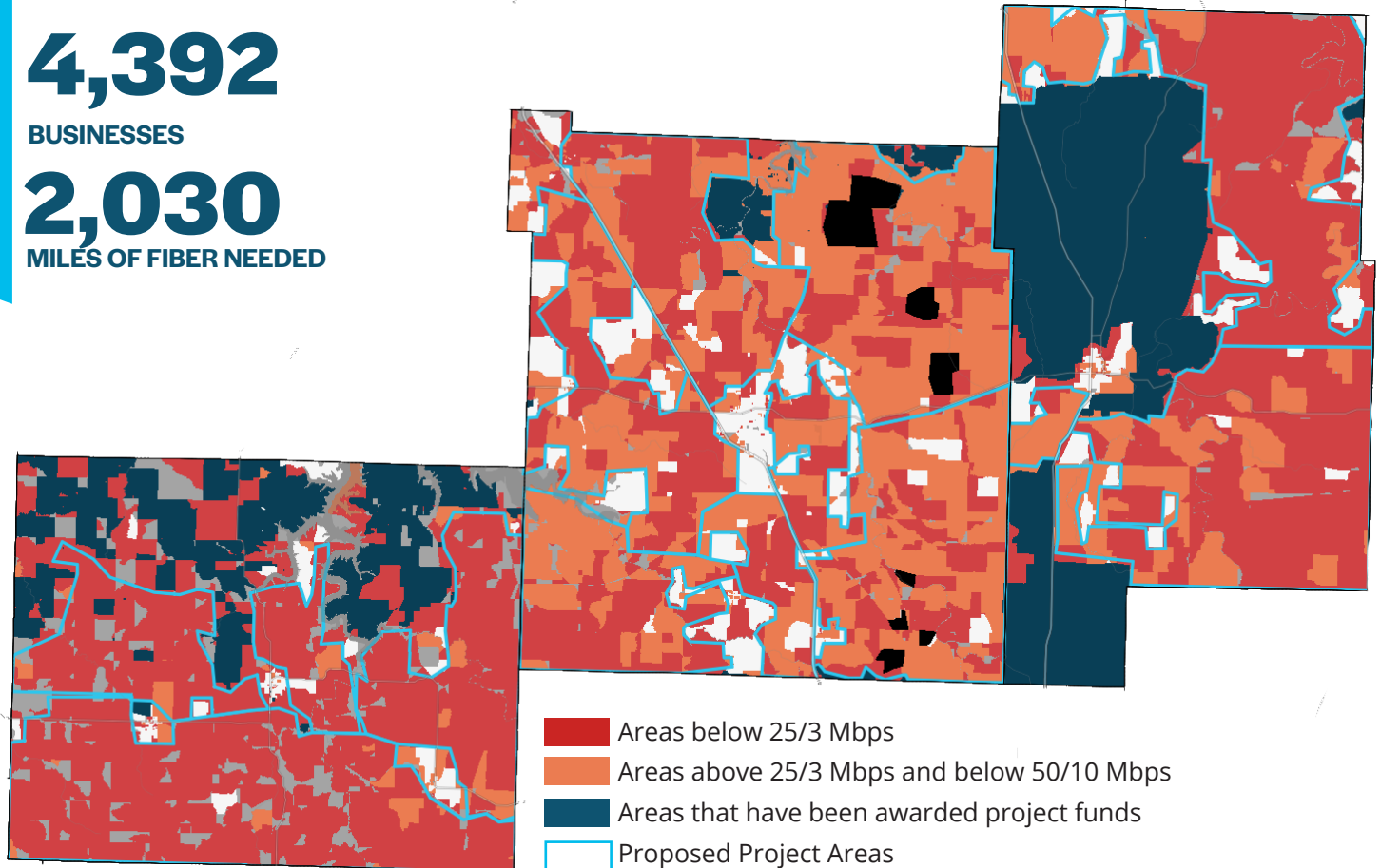
LOCATIONS

4,392

BUSINESSES

2,030

MILES OF FIBER NEEDED



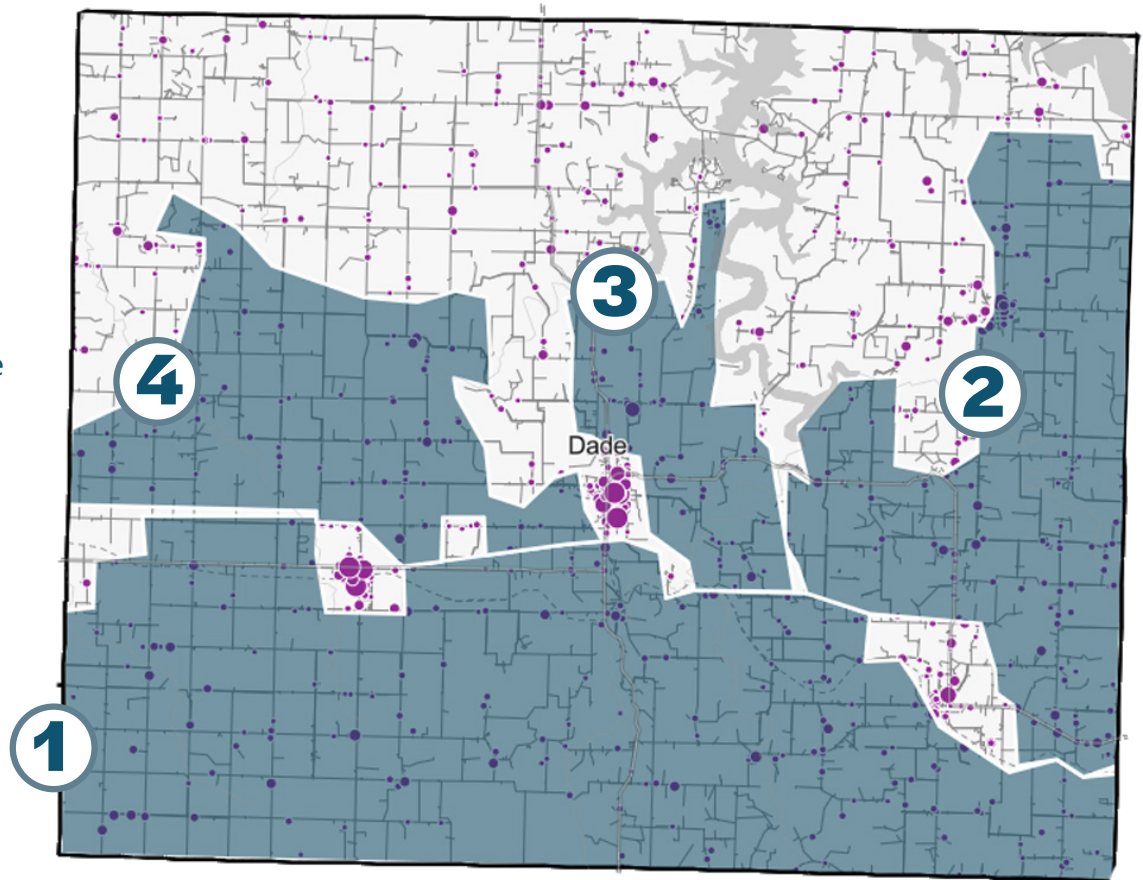
Investment Range = \$180.7 - \$397 million

**Investment projections take into account the total number of fiber miles, deployment type [aerial or underground] and the computation of low, mid and high project cost. A full explanation of our methodology and calculation tables can be found in the [Appendix 1 and 2](#).*

DADE COUNTY

PROJECT AREAS

With the exception of higher population density communities like Lockwood, Greenfield, and Everton, the majority of Dade County is unserved. South and central Dade include large, continuous areas that rate below 25/3 Mbps punctuated by a handful of blocks that are above 25/3 but still below 50/10 Mbps. To aid in planning, we divided these areas into 4 project areas. If sufficient funding is available, these can be combined into one or more larger project proposals. It should be noted that, while the northern part of the county appears to have much unserved/unfunded territory, all of the locations in the unfunded blocks are on roads that serve as funding boundaries. In such cases, the funded provider is likely to serve both sides of the road.



■ Proposed Project Area
● ● Business Locations [the larger the dot the greater the broadband demand]

557
fiber miles

1,881
locations

551
business locations

3.4
locations per mile

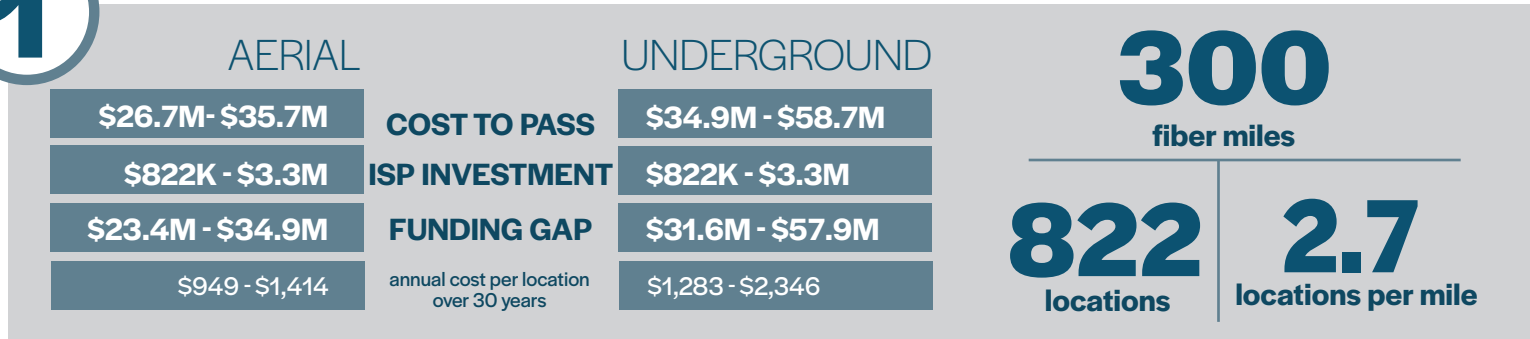
INVESTMENT = \$49.6 - \$109million

**Investment projections take into account the total number of fiber miles, deployment type [aerial or underground] and the computation of low, mid and high project cost. A full explanation of our methodology and calculation tables can be found in the [Appendix 1 and 2](#).*

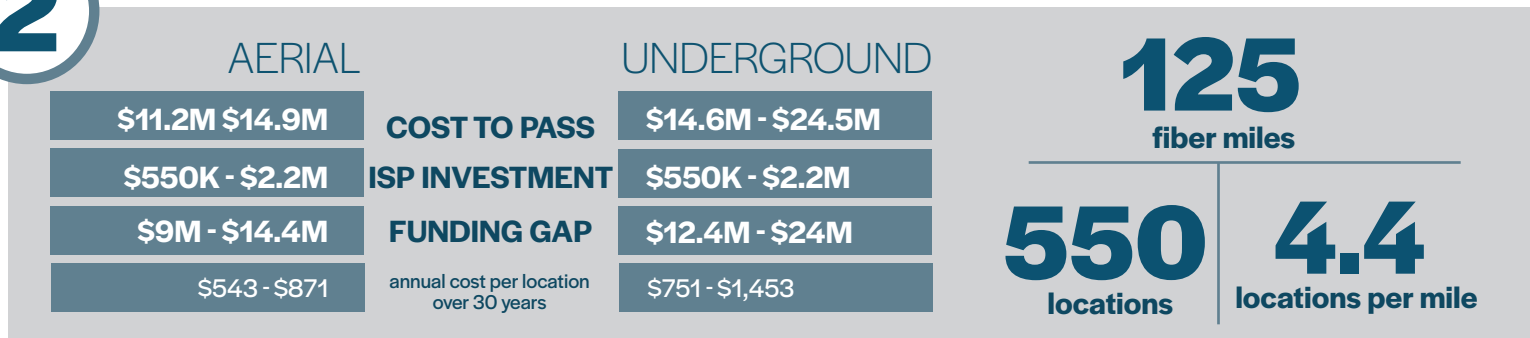
DADE COUNTY

PROJECT DETAILS

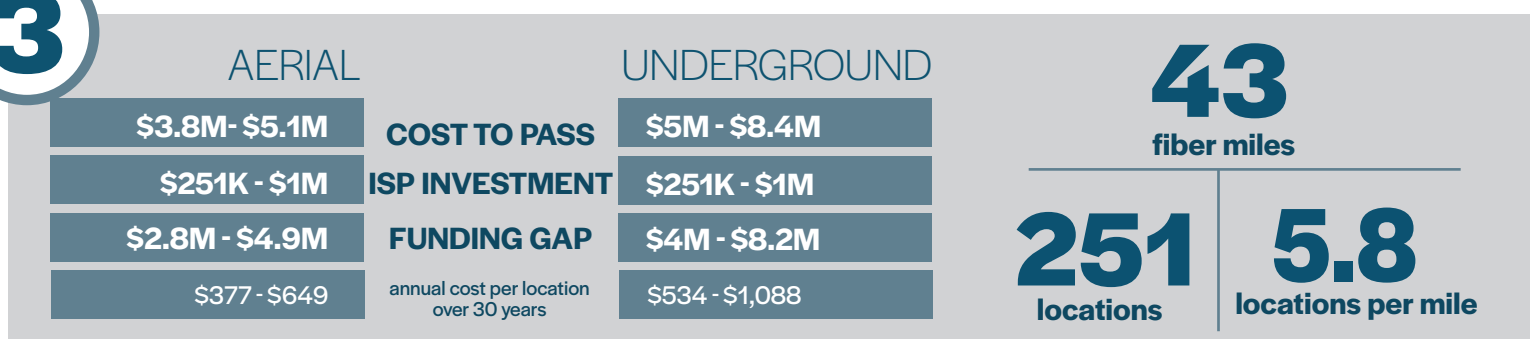
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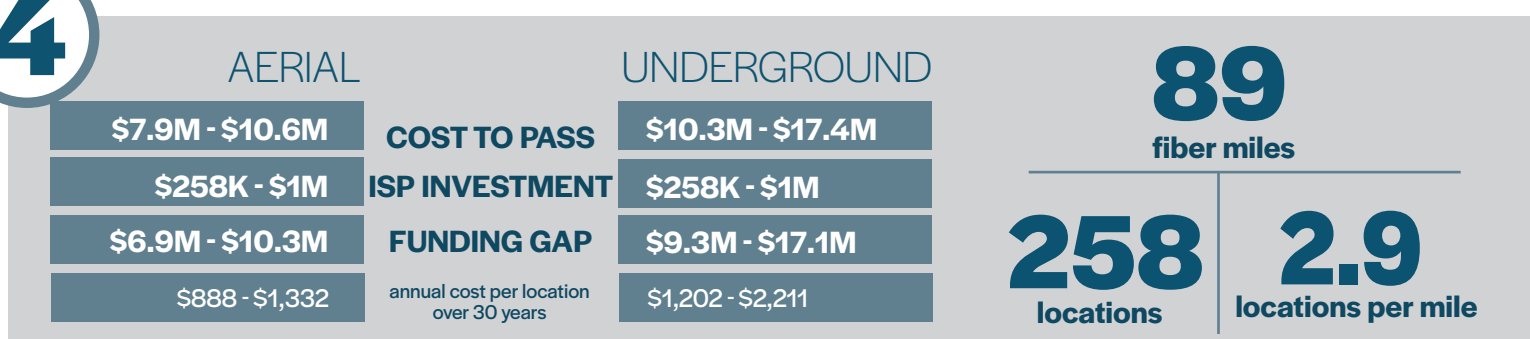
2



3

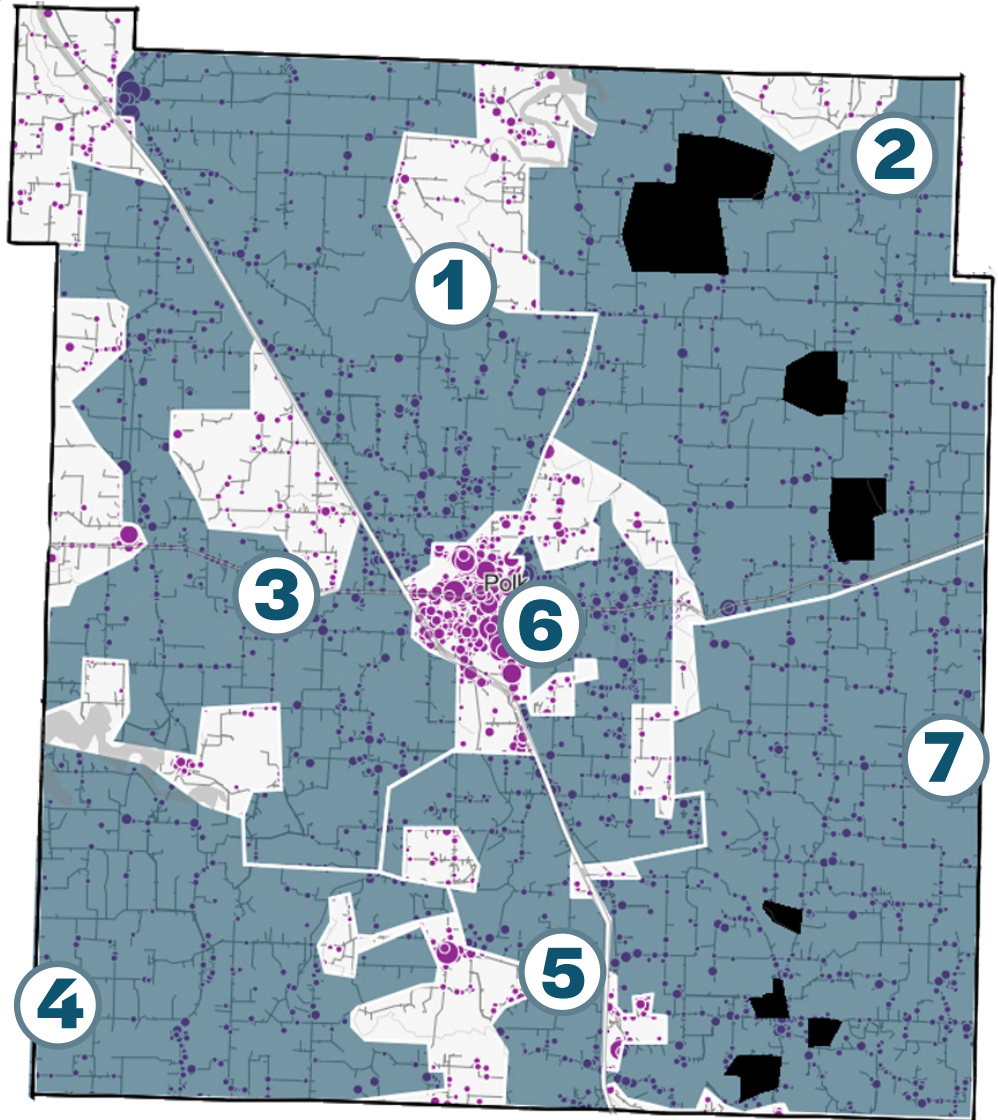


4



POLK COUNTY PROJECT AREAS

Other than the areas around Bolivar, Morrisville, and Fair Play, much of Polk County is underserved, with speeds above 25/3 Mbps but below 50/10 Mbps. Mixed in among these areas are multiple blocks that rate below 25/3 Mbps with some unable to achieve 10/1 Mbps. With only a handful of funded-to-served locations, we chose to break the county up into multiple adjacent project areas. Should sufficient funding be available, these could be combined to create one or more larger project areas. The two project areas on the eastern side of the county include several small, funded territories. We excluded the locations in these areas from our budget estimates.



Proposed Project Area
 Funded or served excluded from calculation
 • Business Locations *[the larger the dot the greater the broadband demand]*

1,005
fiber miles

7,801
locations

2,772
business locations

7.8
locations per mile

INVESTMENT = \$89.4m - \$196.5 million

**Investment projections take into account the total number of fiber miles, deployment type [aerial or underground] and the computation of low, mid and high project cost. A full explanation of our methodology and calculation tables can be found in the [Appendix 1 and 2](#).*

POLK COUNTY

PROJECT DETAILS

1

AERIAL		COST TO PASS		UNDERGROUND		170 fiber miles	
\$15.1M - \$20.2M		\$19.8M - \$33.2M				1,667 locations	9.8 locations per mile
\$1.7M - \$6.7M	ISP INVESTMENT	\$1.7M - \$6.7M					
\$8.4M - \$18.5M	FUNDING GAP	\$13M - \$31.5M					
\$169 - \$371	annual cost per location over 30 years	\$262 - \$631					

2

AERIAL		COST TO PASS		UNDERGROUND		220 fiber miles	
\$19.6M - \$26.2M		\$25.6M - \$43M				1,152 locations	5.2 locations per mile
\$1.2M - \$4.6M	ISP INVESTMENT	\$1.2M - \$4.6M					
\$15M - \$25M	FUNDING GAP	\$21M - \$41.9M					
\$434 - \$725	annual cost per location over 30 years	\$609 - \$1,213					

3

AERIAL		COST TO PASS		UNDERGROUND		153 fiber miles	
\$13.6M - \$18.2M		\$17.8M - \$30M				959 locations	6.3 locations per mile
\$959K - \$3.8M	ISP INVESTMENT	\$959K - \$3.8M					
\$9.8M - \$17.3M	FUNDING GAP	\$14M - \$29M					
\$341 - \$600	annual cost per location over 30 years	\$487 - \$1,008					

4

AERIAL		COST TO PASS		UNDERGROUND		135 fiber miles	
\$12M - \$16M		\$15.7M - \$26.3M				710 locations	5.3 locations per mile
\$710K - \$2.8M	ISP INVESTMENT	\$710K - \$2.8M					
\$9.1M - \$15.3M	FUNDING GAP	\$12.8M - \$25.6M					
\$429 - \$718	annual cost per location over 30 years	\$602 - \$1,202					

POLK COUNTY

PROJECT DETAILS

5

AERIAL		UNDERGROUND		62 fiber miles	
\$5.5M - \$7.4M	COST TO PASS	\$7.2M - \$12.1M		461 locations	7.4 locations per mile
\$461K - \$1.8M	ISP INVESTMENT	\$461K - \$1.8M			
\$3.7M - \$6.9M	FUNDING GAP	\$5.4M - \$11.7M			
\$265 - \$499	annual cost per location over 30 years	\$388 - \$842			

6

AERIAL		UNDERGROUND		60 fiber miles	
\$5.4M - \$7.2M	COST TO PASS	\$7M - \$11.8M		876 locations	14.5 locations per mile
\$876K - \$3.5M	ISP INVESTMENT	\$876K - \$3.5M			
\$1.9M - \$6.3M	FUNDING GAP	\$3.5M - \$10.9M			
\$71 - \$240	annual cost per location over 30 years	\$134 - \$416			

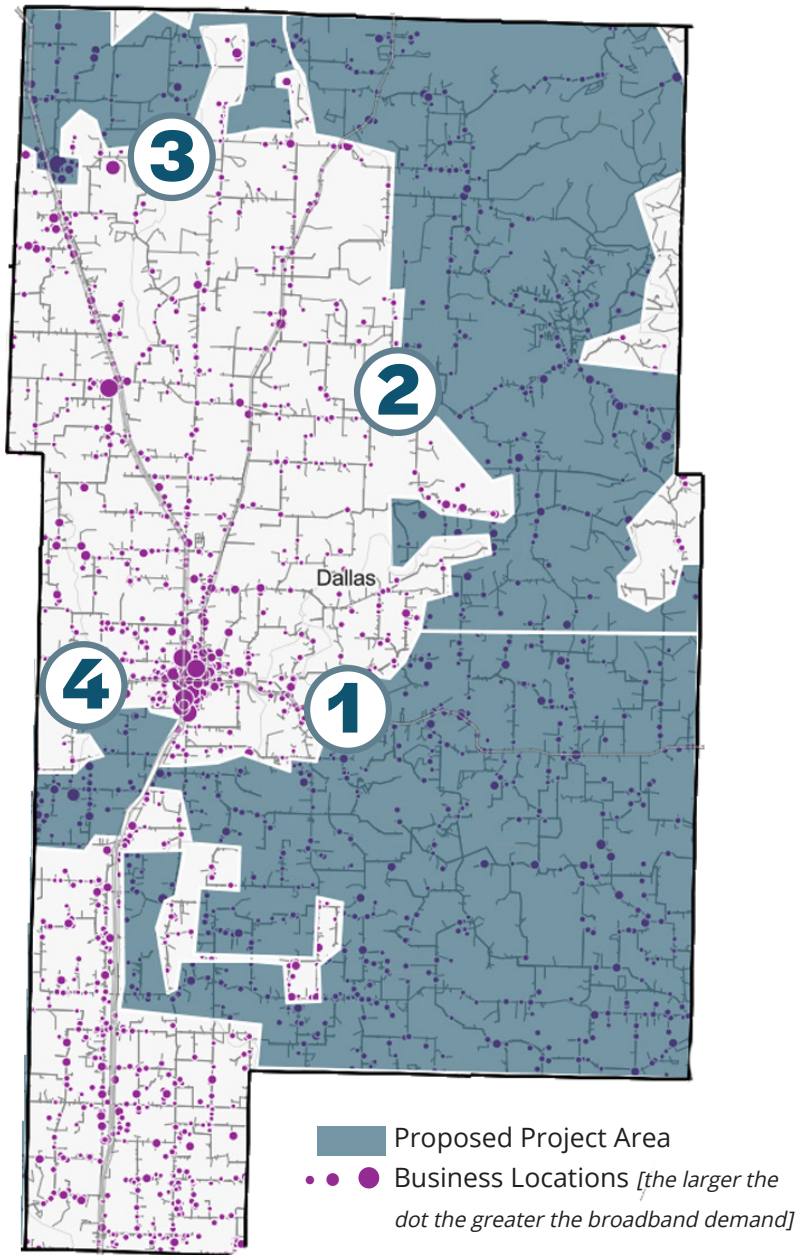
7

AERIAL		UNDERGROUND		205 fiber miles	
\$18.2M - \$24.3M	COST TO PASS	\$23.8M - \$40M		1,976 locations	9.7 locations per mile
\$2M - \$7.9M	ISP INVESTMENT	\$2M - \$7.9M			
\$10.3M - \$23.4M	FUNDING GAP	\$15.9M - \$38M			
\$174 - \$377	annual cost per location over 30 years	\$268 - \$641			

DALLAS COUNTY

PROJECT AREAS

Most of the unserved/underserved areas in the western half of Dallas County are covered by two large existing awards; however, significant need remains in the east. We defined a total of four project areas in the county, two large outlines in the east and two smaller areas in the west. Of the two eastern project areas, area #2 has a higher percentage of unserved vs underserved territory. All four areas share at least one boundary. With sufficient funding, some or all of the areas could be combined into a single larger project.



468
fiber miles

3,158
locations

1,069
business locations

6.7
locations per mile

INVESTMENT = \$41.7 - \$91.6 million

**Investment projections take into account the total number of fiber miles, deployment type [aerial or underground] and the computation of low, mid and high project cost. A full explanation of our methodology and calculation tables can be found in the [Appendix 1 and 2](#).*

DALLAS COUNTY

PROJECT DETAILS

1

AERIAL		UNDERGROUND		SUMMARY	
\$22.2M - \$29.7M	COST TO PASS	\$29M - \$48.8M		249 fiber miles	1,771 locations
\$1.8M - \$7M	ISP INVESTMENT	\$1.8M - \$7M			
\$15M - \$27.9M	FUNDING GAP	\$22M - \$47M			
\$284 - \$525	annual cost per location over 30 years	\$413 - \$884			
					7.1 locations per mile

2

AERIAL		UNDERGROUND		SUMMARY	
\$14.2M - \$19M	COST TO PASS	\$18.5M - \$31.1M		159 fiber miles	895 locations
\$895K - \$3.6M	ISP INVESTMENT	\$895K - \$3.6M			
\$10.6M - \$18M	FUNDING GAP	\$14.9M - \$30.2M			
\$394 - \$671	annual cost per location over 30 years	\$556 - \$1,125			
					5.6 locations per mile

3

AERIAL		UNDERGROUND		SUMMARY	
\$3.7M - \$5M	COST TO PASS	\$4.9M - \$8.2M		42 fiber miles	379 locations
\$379K - \$1.5M	ISP INVESTMENT	\$379K - \$1.5M			
\$2.2M - \$4.6M	FUNDING GAP	\$3.3M - \$7.8M			
\$194 - \$404	annual cost per location over 30 years	\$295 - \$686			
					9.1 locations per mile

4

AERIAL		UNDERGROUND		SUMMARY	
\$1.6M - \$2.2M	COST TO PASS	\$2.1M - \$3.6M		18 fiber miles	113 locations
\$113K - \$452K	ISP INVESTMENT	\$113K - \$452K			
\$1.2M - \$2M	FUNDING GAP	\$1.7M - \$3.4M			
\$344 - \$604	annual cost per location over 30 years	\$491 - \$1,015			
					6.2 locations per mile

APPENDIX 1

Broadband Mapping and Methodology

ABOUT THE MAPPING

Statewide, Regional, and County profiles were created under contract by Reid Consulting Group, LLC. for Missouri Association of Councils of Government (MACOG).

Broadband coverage maps are based on a rating system developed by Reid Consulting Group, LLC. Data sources include Ookla Speedtest Intelligence® data licensed by MACOG for the months of December 2020 through December 2023, carrier filings of available speeds with the FCC Fabric, carrier reports of actual broadband deployments to USAC (HUBB), RDOF Phase 1 eligibility, and population density.

Unserved and underserved ratings are color coded at the census block and block group level:

- Dark Red: Below 10/1 Mbps
- Red: Above 10/1; Below 25/3 Mbps
- Orange: Above 25/3; Below 50/10 Mbps
- Yellow: Above 50/10; Below 100/20 Mbps
- Light Green: Above 100/20; Below 200/50 Mbps
- Green: Above 200/50 Mbps
- Grey: Areas with no data/ speedtests submitted / no population

We conducted analysis of the raw Ookla® data for the months of December 2020 through July 2023, applying the following filters:

Filter

Include desktop, iOS, and Android app results*

Exclude results with GPS precision of greater than 200 meters**

Include only results from fixed broadband providers

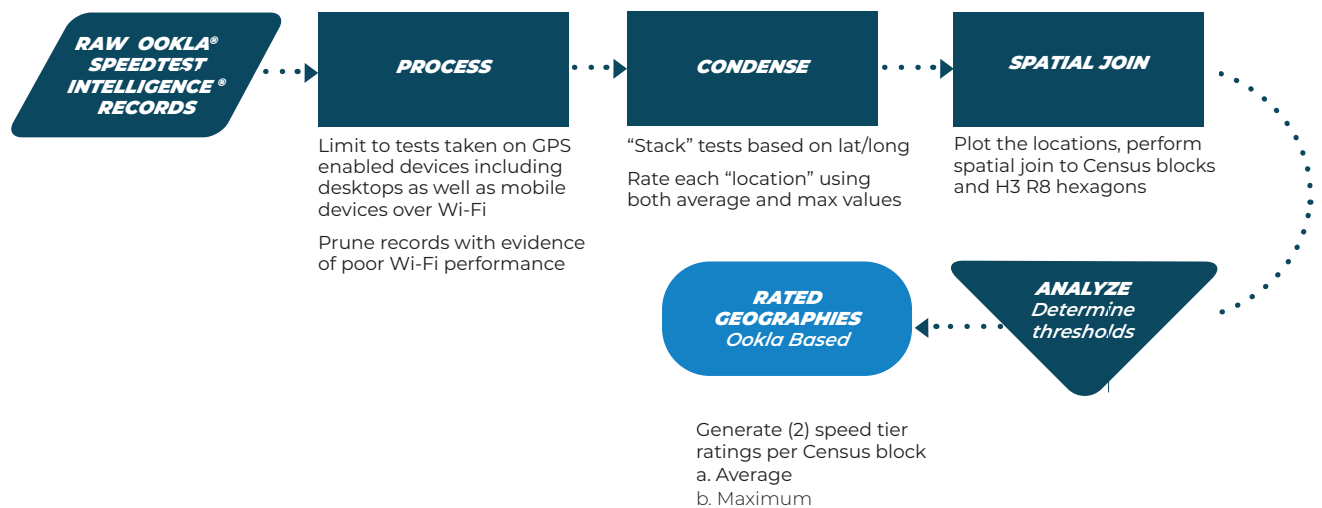
**iOS and Android results were included only if the device was connected to wi-fi during the speed test.*

*** To protect consumer privacy, Ookla® limits location precision to +/-100 meters. As a result, a single location may include multiple households and many individual tests.*

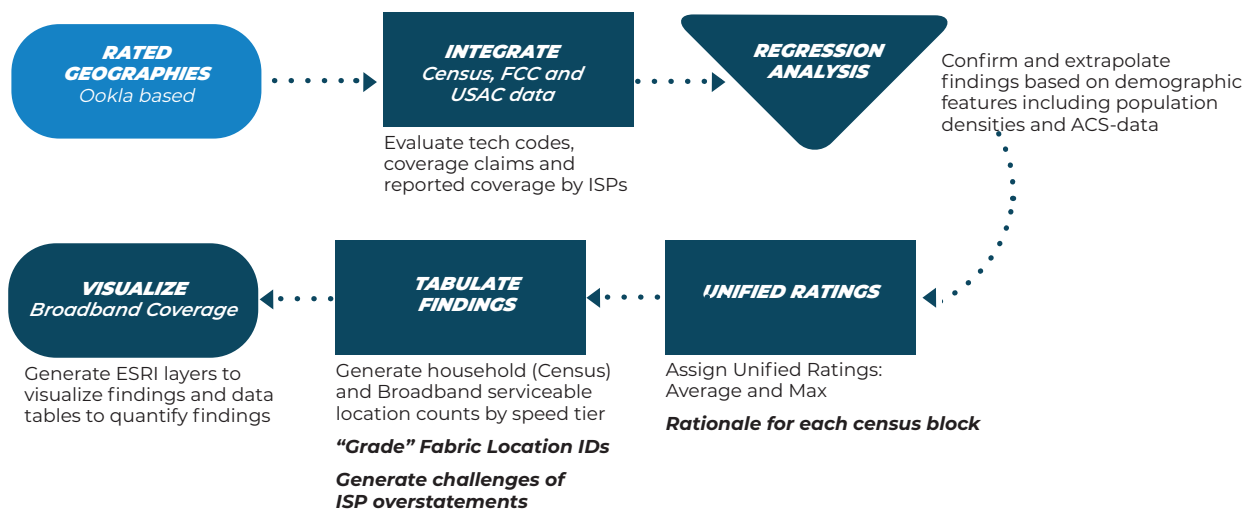
ANALYZING THE DATA

Using the Ookla® results we rated each location based on the maximum of up/down speeds for all tests at that location. We then graded census blocks based on the median up/down rating of all locations within each block. Block-by-block ratings were further refined based on RDOF eligibility, past HUBB deployments, and Form 477/ Fabric availability data. For blocks with no Ookla test results, extrapolated ratings were assigned where possible via comparative analysis of population density, block group ratings, FCC Fabric, HUBB data, and RDOF Phase 1 awards. Areas that could not be assigned an extrapolated rating are shown in gray on the map.

Generating Speed Ratings



Layering Additional Data Sources



BUSINESS BROADBAND OPPORTUNITY INDEX

Business demand for broadband varies based on company size and economic sector. The more employees at any given business location, the greater the demand will be for that location. Certain types of businesses also tend to consume more bandwidth regardless of size. For example, a medical clinic with 50 employees will need significantly more capacity than a construction contractor of similar size.

When planning for broadband expansion, it is important to consider the effect businesses have on overall need. The presence of a high-demand business or multiple businesses of any size in a particular area may make that area significantly more attractive to a broadband provider than the surrounding population density would predict.

The Business Broadband Opportunity Index helps planners visualize this economic impact by mapping the location of every business (as identified by Dun & Bradstreet) with a dot size proportional to that business' expected broadband demand. The larger the dot, the greater the demand. Calculations are as follows:

$$\text{OPPORTUNITY INDEX} = \text{BUSINESS SIZE} * \text{INDEX MULTIPLIER}$$

Business Size

Number of employees as reported in Dun & Bradstreet. If count is blank, assume 1 employee.

Index Multiplier

A number from 1-5 based on industry sector.

On the Map

The greater the demand, the bigger the dot. To aid with visualization, comparative rankings from 1 to 10 are also assigned.

Category	Multiplier
Healthcare	5
Education & Libraries	5
Telecom and IT	5
Banking and Finance	5
Professional Services	4
Publishers	4
Real Estate	3
Hospitality	3
Non-Profit	3
Wholesalers	2
Dealers and Retail	2
Transportation	2
Childcare	2
Sports, Music & Arts	2
Religious and Fraternal	2
Manufacturing	2
Printing	2
Restaurants & Food	2
Farming	1
Hunting, Fishing	1
Energy	1
Raw Materials	1
Contractors	1
Textiles	1
Unclassified	1

APPENDIX 2

Budget Projections

The budget is based on a fiber-to-the-home network with enough capacity to meet demand for the next 30 years. Expected investments and the funding gap will vary based on the area to be served, the population density, and the presence or absence of other services.

COST ESTIMATES

Investment Range

The Project Cluster Investment Range represents the lowest cost to the highest cost of to serve the total number of locations that are identified as below 50/10 Mbps the entire County Cluster. In most cases the lowest cost represents aerial fiber deployment and the highest cost represents underground fiber deployment. For the individual counties, it is the average of the lowest and cost of each project area.

The total cost for each project area is the sum of make-ready and cost-to-pass multiplied by the number of unserved state, county, township, and unincorporated road miles.

$$\text{Unserved Miles} * (\text{Make-Ready} + \text{Cost-to-Pass}) + (\text{Number of locations} * \text{Network electronics})$$

$$\text{Fiber Miles to Reach Target} * \text{Cost per Mile} = \text{Cost to Pass}$$

ISP Investment

This is the total an internet provider can spend to install fiber and still make a profit, estimated between \$1000 and \$4000 per household. As population density goes down, costs go up while expected investment remains the same.

$$\text{Households in Service Area} * \text{Investment per household}$$

Funding Gap

The funding gap is the difference between the total cost of the project and the available or anticipated private investment. For an internet service offering to be sustainable, grant or other public funding must be used to close this gap.

$$\text{Funding Gap} = \text{Total Projected Cost} - \text{ISP Investment}$$

30 Year Annual Cost

The 30 year amortized gap per household is calculated by dividing the funding gap by 30, then dividing the resulting figure by the total number of locations in the project area.

$$\text{Gap per location} = (\text{Funding Gap} \div \text{Number of households}) \div 30 \text{ years}$$

Fiber Miles

Fiber distance is based on the number of unserved state, county, local municipal and unincorporated road miles within the county.

Locations per Mile

Total number of unserved households divided by the number of unserved state, county, township, and unincorporated road miles.

APPENDIX 3

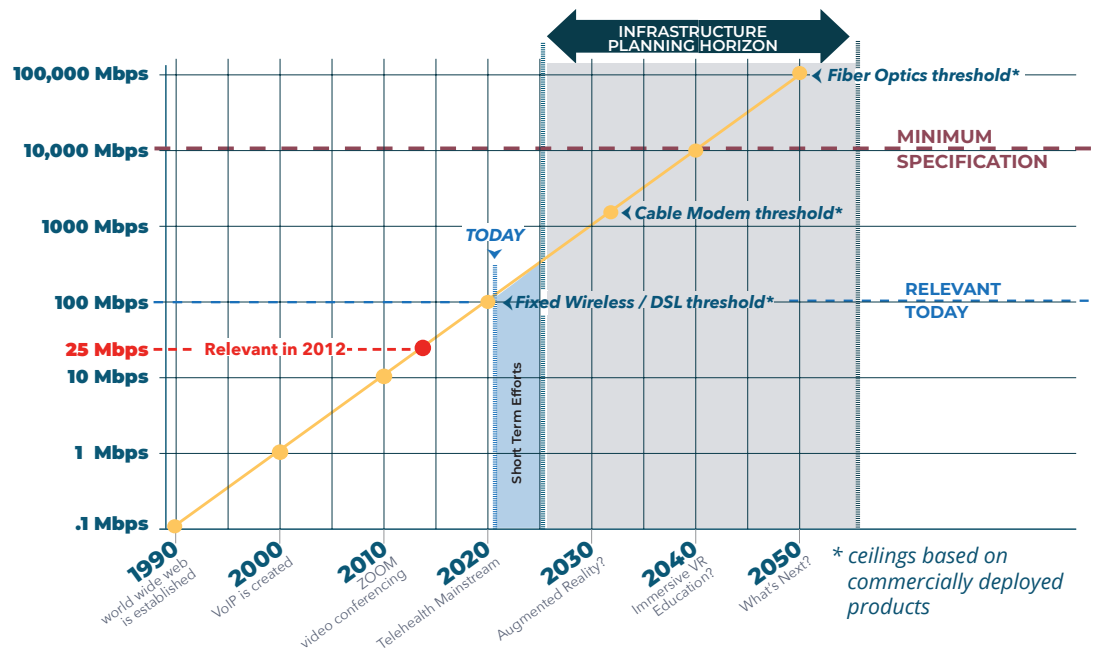
Planning for the Future

BUILDING FOR THE FUTURE

For planning purposes, broadband deployments must be treated like infrastructure projects. Much like water, sewer, and roads, broadband networks should be designed to last decades rather than years. Networks installed today should utilize technologies, materials, and design specifications that will deliver 30-to-40-year longevity. Networks also should have sufficient capacity to meet not only current needs but also those of 2055.

Given the capital costs and construction requirements for broadband, we recommend a planning window that starts in 2025 and continues through 2055. This timeline assumes a three to four year deployment window which will vary based on project size, supply chain complexities and labor availability.

Since the web was invented in 1990, broadband demand has increased ten-fold every decade.



When home internet first became common, most households connected using landline modems that operated at 56 Kbps (0.056 Mbps). By 2000, speeds had increased to 1 Mbps. A decade later, a well-served household could expect 10 Mbps. The FCC's current 25/3 Mbps threshold was last relevant in 2012, when the average download speed reached 25 Mbps. Currently, someone living in a well-served area can expect at least 100 Mbps down/20 Mbps up.

With remote work and learning, telehealth, and virtual reality quickly becoming mainstream, it is not difficult to imagine the average speed reaching 1,000 Mbps (1 Gbps) ten years from now. In fact, many internet providers already offer 1 Gbps and 2 Gbps plans with business connections and some residential connections routinely operating at 10 Gbps. Some backbone and middle mile networks already operate on 100 Gbps and 400 Gbps connectivity.

APPENDIX 4

Challenge Process

Reid Consulting Group filed multiple rounds of FCC bulk challenges on behalf of MACOG. These challenges included addresses from across the state and targeted exaggerated claims from DSL providers and licensed fixed wireless carriers. Justification for these challenges combined knowledge of existing infrastructure with statistical analysis of crowdsourced speed test data. Because the FCC does not consider speed test data alone to be a valid basis for challenge, we cited our speed test analysis only as corroborating evidence to our primary infrastructure arguments. Those arguments were as follows:

DSL Cable Plant in Disrepair

DSL service, not only in rural Missouri but also across the rest of rural America, is delivered via twisted pair copper telephone cables that were originally installed in the 1940s-1960s. Most of those cables remain in service today. When delivered over well-maintained lines, DSL is capable of delivering reliable broadband service; however, almost all of our country's landline copper telephone cables are 50+ years old. With a useful lifespan of just 30 years, those cables are no longer to deliver reliable telephone service, let alone broadband.

Based on the decrepit condition of the country's twisted pair landline infrastructure, we challenged any location where a DSL provider claimed speeds above 25/3 Mbps.

Speed Rating Threshold

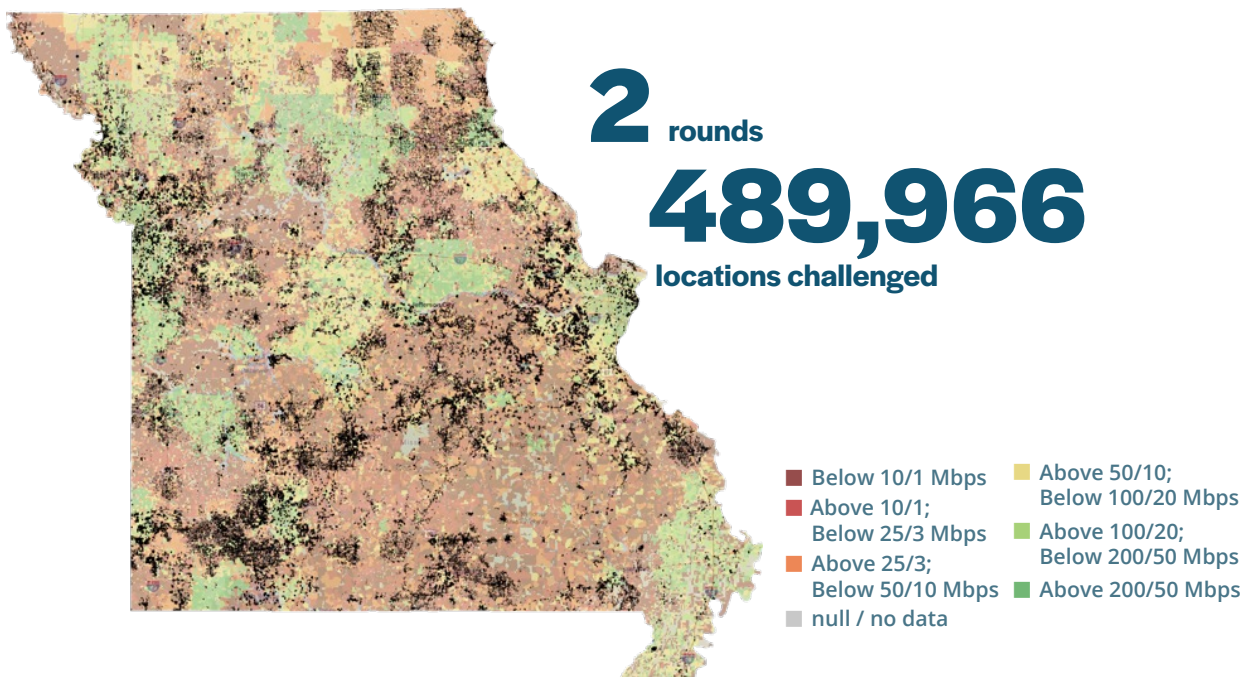
For all technologies, we only challenged locations where our maps showed speeds were below 25/3 Mbps and carrier claims were at least two speed tiers higher. For example, in our first round of fixed wireless challenges, we challenged nearly 48,000 locations that were claimed to be between 100/20 and 200/50 Mbps but which tested below 25/3 Mbps. An additional 27,000+ locations had no test results above 10/1 Mbps. The FCC does not accept this sort of analysis as a challenge justification. We included the data with our challenges anyway, to provide corroboration of our primary justifications and to ensure that the stark difference between carrier claims and citizen reality was documented in public record via the FCC Docket.

Fixed Wireless not a Mass Market Solution

Fixed wireless providers have significantly overstated their technology's geographic coverage and its ability to provide speeds above 100/20 Mbps at mass market take-rates. Our bulk challenge justification cited two specific justifications:

Overly optimistic signal propagation model: Fixed wireless carriers draw a 5-mile radius around each of their macro-towers and claim to offer 100/20 (or in some cases, gigabit speeds) to every location within that radius. Because fixed wireless requires line-of-sight transmission, such coverage is possible only in flat terrain. In hilly areas, particularly the steep terrain of the Ozarks, many subscribers will be unable to "see" a fixed wireless tower. To demonstrate just how widespread this problem can be, we conducted detailed, multi-tower viewshed analyses of multiple areas in the state, each representative of the kind of terrain found in that part of the state. Our analysis showed that even moderately rolling terrain included at least some signal shadows. In steep terrain, more locations were without signal than with. To make matters worse, frequencies above 3 GHz are readily absorbed by the water in tree leaves. These microwave band frequencies are now the most popular fixed wireless frequencies, in part because as frequencies rise, so does theoretical data capacity. With much of the southern part of the state heavily forested, signal attenuation makes fixed wireless even less viable.

Limited bandwidth on macro sites: Even if signal propagation were not an issue, bandwidth still would be a problem. For fixed wireless to be a mass-market solution, it must be able to support speeds of at least 100/20 Mbps for 80% of the locations within its coverage radius. Small cell wireless technology is capable of meeting this standard, but all of the providers in Missouri are using only macro towers. For macro-tower fixed wireless, all customers share bandwidth on the same transceiver or, in the best case, on a handful of directional transceivers that divide that tower's territory into quadrants. These transceivers are capable of delivering 100/20 Mbps to a small number of subscribers simultaneously, but if hundreds of subscribers were to connect at the same time, that tower's limited bandwidth would quickly be oversubscribed.



STATEWIDE CHALLENGES

Missouri Combined Challenges | Round 1

ISP Reported	Max observed	Rating Delta	Location Count	Challenge Status
6, Above 200/50	1, Below 10/1	5	1,243	Challenged
6, Above 200/50	2, Above 10/1; Below 25/3	4	2,776	Challenged
5. Above 100/20; Below 200/50	1, Below 10/1	4	27,545	Challenged
5. Above 100/20; Below 200/50	2, Above 10/1; Below 25/3	3	47,880	Challenged
4. Above 50/10; Below 100/20	1, Below 10/1	3	6,109	Challenged
4. Above 50/10; Below 100/20	2, Above 10/1; Below 25/3	2	15,658	Challenged
3. Above 25/3; Below 50/10	1, Below 10/1	2	60,546	Challenged
3. Above 25/3; Below 50/10	2, Above 10/1; Below 25/3	1	124,639	Not Challenged
Locations with a Rating Delta of 2 or higher			161,757	Challenged
Locations with a Rating Delta of 1			124,639	Not Challenged

Missouri Fixed Wireless

ISP Reported	Max observed	Rating Delta	Location Count	Challenge Status
6, Above 200/50	1, Below 10/1	5	1,182	Challenged
6, Above 200/50	2, Above 10/1; Below 25/3	4	2,537	Challenged
5. Above 100/20; Below 200/50	1, Below 10/1	4	26,302	Challenged
5. Above 100/20; Below 200/50	2, Above 10/1; Below 25/3	3	44,930	Challenged
4. Above 50/10; Below 100/20	1, Below 10/1	3	2,727	Challenged
4. Above 50/10; Below 100/20	2, Above 10/1; Below 25/3	2	7,741	Challenged
3. Above 25/3; Below 50/10	1, Below 10/1	2	43,362	Challenged
3. Above 25/3; Below 50/10	2, Above 10/1; Below 25/3	1	92,144	Not Challenged
Locations with a Rating Delta of 2 or higher			128,781	Challenged
Locations with a Rating Delta of 1			92,144	Not Challenged

Missouri DSL

ISP Reported	Max observed	Rating Delta	Location Count	Challenge Status
6, Above 200/50	1, Below 10/1	5	61	Challenged
6, Above 200/50	2, Above 10/1; Below 25/3	4	239	Challenged
5. Above 100/20; Below 200/50	1, Below 10/1	4	1,243	Challenged
5. Above 100/20; Below 200/50	2, Above 10/1; Below 25/3	3	2,950	Challenged
4. Above 50/10; Below 100/20	1, Below 10/1	3	3,382	Challenged
4. Above 50/10; Below 100/20	2, Above 10/1; Below 25/3	2	7,917	Challenged
3. Above 25/3; Below 50/10	1, Below 10/1	2	17,184	Challenged
3. Above 25/3; Below 50/10	2, Above 10/1; Below 25/3	1	32,495	Not Challenged
Locations with a Rating Delta of 2 or higher			32,976	Challenged
Locations with a Rating Delta of 1			32,495	Not Challenged

Missouri Combined Challenges | Round 2

ISP Reported	Max observed	Rating Delta	Location Count	Challenge Status
6, Above 200/50	1, Below 10/1	5	31,510	Challenged
6, Above 200/50	2, Above 10/1; Below 25/3	4	29,801	Challenged
6, Above 200/50	3, Above 25/3; Below 50/10	3	68,770	Challenged
5, Above 100/20; Below 200/50	1, Below 10/1	4	44,655	Challenged
5, Above 100/20; Below 200/50	2, Above 10/1; Below 25/3	3	46,371	Challenged
5, Above 100/20; Below 200/50	3, Above 25/3; Below 50/10	2	51,870	Challenged
4, Above 50/10; Below 100/20	1, Below 10/1	3	6,136	Challenged
4, Above 50/10; Below 100/20	2, Above 10/1; Below 25/3	2	7,681	Challenged
3, Above 25/3; Below 50/10	1, Below 10/1	2	41,415	Challenged
3, Above 25/3; Below 50/10	2, Above 10/1; Below 25/3	1	48,398	Not Challenged
Totals			328,209	Challenged
			48,398	Not Challenged

Missouri Fixed Wireless Challenges | Round 2

ISP Reported	Max observed	Rating Delta	Location Count	Challenge Status
6, Above 200/50	1, Below 10/1	5	810	Challenged
6, Above 200/50	2, Above 10/1; Below 25/3	4	2,450	Challenged
5, Above 100/20; Below 200/50	1, Below 10/1	4	30,521	Challenged
5, Above 100/20; Below 200/50	2, Above 10/1; Below 25/3	3	30,065	Challenged
4, Above 50/10; Below 100/20	1, Below 10/1	3	3,673	Challenged
4, Above 50/10; Below 100/20	2, Above 10/1; Below 25/3	2	3,420	Challenged
3, Above 25/3; Below 50/10	1, Below 10/1	2	25,400	Challenged
3, Above 25/3; Below 50/10	2, Above 10/1; Below 25/3	1	26,683	Not Challenged
Totals			96,339	Challenged
			26,683	Not Challenged

Missouri DSL Challenges | Round 2

ISP Reported	Max observed	Rating Delta	Location Count	Challenge Status
6, Above 200/50	1, Below 10/1	5	497	Challenged
6, Above 200/50	2, Above 10/1; Below 25/3	4	774	Challenged
5, Above 100/20; Below 200/50	1, Below 10/1	4	921	Challenged
5, Above 100/20; Below 200/50	2, Above 10/1; Below 25/3	3	1,531	Challenged
4, Above 50/10; Below 100/20	1, Below 10/1	3	2,463	Challenged
4, Above 50/10; Below 100/20	2, Above 10/1; Below 25/3	2	4,261	Challenged
3, Above 25/3; Below 50/10	1, Below 10/1	2	16,015	Challenged
3, Above 25/3; Below 50/10	2, Above 10/1; Below 25/3	1	21,715	Not Challenged
Totals			26,462	Challenged
			21,715	Not Challenged

Missouri Fiber Challenges | Round 2

ISP Reported	Max observed	Rating Delta	Location Count	Challenge Status
6, Above 200/50	1, Below 10/1	5	24,189	Challenged
6, Above 200/50	2, Above 10/1; Below 25/3	4	18,746	Challenged
6, Above 200/50	3, Above 25/3; Below 50/10	3	45,664	Challenged
5, Above 100/20; Below 200/50	1, Below 10/1	4	1,925	Challenged
5, Above 100/20; Below 200/50	2, Above 10/1; Below 25/3	3	2,074	Challenged
5, Above 100/20; Below 200/50	3, Above 25/3; Below 50/10	2	5,861	Challenged
Totals			98,459	Challenged

Missouri Cable Modem Challenges | Round 2

ISP Reported	Max observed	Rating Delta	Location Count	Challenge Status
6, Above 200/50	1, Below 10/1	5	6,014	Challenged
6, Above 200/50	2, Above 10/1; Below 25/3	4	7,831	Challenged
6, Above 200/50	3, Above 25/3; Below 50/10	3	23,106	Challenged
5, Above 100/20; Below 200/50	1, Below 10/1	4	11,288	Challenged
5, Above 100/20; Below 200/50	2, Above 10/1; Below 25/3	3	12,701	Challenged
5, Above 100/20; Below 200/50	3, Above 25/3; Below 50/10	2	46,009	Challenged
Totals			106,949	Challenged

REGIONAL CHALLENGES BY COUNTY: ROUND 2

Provider Claimed Speed	Above 25/3; Below 50/10		Above 50/10; Below 100/20		Above 100/20; Below 200/50			Above 200/50			Grand Total
	Below 10/1	Above 10/1; Below 25/3	Below 10/1	Above 10/1; Below 25/3	Below 10/1	Above 10/1; Below 25/3	Above 25/3; Below 50/10	Below 10/1	Above 10/1; Below 25/3	Above 25/3; Below 50/10	
Barry County	377	3	14	37	87	81	56	129	249	754	1787
Cable					38	28	56	15	27	104	268
Cox Communications						5					5
MCC Missouri LLC								15	27	104	146
Optimum					38	23	56				117
DSL	117		13	37	9	40		12	12		240
Brightspeed	107		2								109
Windstream Missouri, Inc.	10		11	37	9	40		12	12		131
Fiber								102	210	650	962
BarryElectricCooperative								98	199	639	936
MISSOURI TELECOM								4	11	11	26
Fixed Wireless	260	3	1		40	13					317
T-Mobile US	21				11	4					36
UNITED STATES CELLULAR CORPORATI	202				8						210
VERIZON	12										12
Windstream Missouri, Inc.	20		1								21
Wisper ISP, LLC	5	3			21	9					38
Christian County	482	16	15	33	366	416	801	456	689	361	3635
Cable					267	285	801	41	6	112	1512
Cable America					149	61	315			58	583
MCC Missouri LLC								41	6	54	101
Optimum					118	224	486				828
DSL	201		15	32	2	9					259
AT&T Inc	47		13	26	2	9					97
Brightspeed	154		2	6							162
Fiber								42	35	249	326
AT&T Inc									8	45	53
Brightspeed									1		1
K-PowerNet LLC										46	46
Sho-Me Technologies, LLC										1	1
Total HighSpeed Internet Solutions								42	26	157	225
Fixed Wireless	281	16		1	97	122		373	648		1538
T-Mobile US	215				60	96		6			377
UNITED STATES CELLULAR CORPORATI	4										4
VERIZON	47							3			50
Wisper ISP, LLC	7	1			36	25			1		70
WON Communications LLC	8	15		1	1	1		364	647		1037
Dade County	104		1	2	1	9	1	145	30	167	460
Cable								145	29	167	341
MCC Missouri LLC								145	29	167	341
DSL	59		1								60
Brightspeed	59		1								60
Fiber					1	8	1		1		11
Miller Telephone Company					1	8	1				10
SpringNet									1		1
Fixed Wireless	45			2		1					48
T-Mobile US	3					1					4
UNITED STATES CELLULAR CORPORATI	22										22
VERIZON	20										20
Windstream Missouri, Inc.				2							2
Dallas County	279	6	9	5	441	636		19	94	442	1931
DSL	233		9	5							247
Brightspeed	233		9	5							247
Fiber					1	8	1		1		11
Fidelity								11	65	418	494
Total HighSpeed Internet Solutions								8	29	24	61
Fixed Wireless	46	6			441	636					1129
T-Mobile US	37				60	47					144
UNITED STATES CELLULAR CORPORATI	3										3
VERIZON	1										1
Wisper ISP, LLC	5	6			381	589					981
Greene County	537	136	45	250	925	784		2206	2176	5881	12940
Cable								490	790	3257	4537
Cable America								112	243	1131	1486
MCC Missouri LLC								378	547	2126	3051
DSL	108		45	250	16	77					496
AT&T Inc	104		41	246	16	77					484
Choctaw Telephone Company	4		2	4							10
Windstream Missouri, Inc.			2								2
Fiber								1556	1227	2624	5407
AT&T Inc								19	55	279	353

Provider Claimed Speed	Above 25/3; Below 50/10		Above 50/10; Below 100/20		Above 100/20; Below 200/50				Above 200/50		
Maximum Speed Test at Location	Below 10/1	Above 10/1; Below 25/3	Below 10/1	Above 10/1; Below 25/3	Below 10/1	Above 10/1; Below 25/3	Above 25/3; Below 50/10	Below 10/1	Above 10/1; Below 25/3	Above 25/3; Below 50/10	Grand Total
Bluebird Network LLC								32	14	266	312
Net Vision Communications								1			1
Sho-Me Technologies, LLC									1	2	3
SpringNet								142	341	1296	1779
Total HighSpeed Internet Solutions								1362	816	781	2959
Fixed Wireless	429	136			909	707		160	159		2500
T-Mobile US	290	6			126	62		10	8		502
UNITED STATES CELLULAR CORPORATI	36				2			12			50
VERIZON	46				7						53
Wisper ISP, LLC	36	88			758	629		15	8		1534
WON Communications LLC	21	42			16	16		123	143		361
Lawrence County	667	69	84	69	700	583	679	189	219	217	3476
Cable					86	110	190	89	104	195	774
MCC Missouri LLC								89	104	195	388
Optimum					86	110	190				386
DSL	134		77	63	10	65		6	56		411
Brightspeed	63			6							69
Choctaw Telephone Company	70		74	2							146
Consolidated Communications, Fidium				1							1
Windstream Missouri, Inc.	1		3	54	10	65		6	56		195
Fiber					178	157	489	94	59	22	999
Choctaw Telephone Company					1						1
K-PowerNet LLC								4		1	5
Miller Telephone Company					177	157	489				823
MISSOURI TELECOM								13	5	6	24
Total HighSpeed Internet Solutions								77	54	15	146
Fixed Wireless	533	69	7	6	426	251					1292
Aire Internet			7	6							13
T-Mobile US	252	62			125	119					558
UNITED STATES CELLULAR CORPORATI	231				51						282
VERIZON	10										10
Wisper ISP, LLC	40	7			250	132					429
Polk County	153	85	73	241	263	569		300	1723	59	3466
DSL	62		29	158	38	197		35	46		565
Brightspeed	38			2							40
Windstream Missouri, Inc.	24		29	156	38	197		35	46		525
Fiber								29	50	59	138
Total HighSpeed Internet Solutions								26	2	8	36
Windstream Missouri, Inc.								3	48	51	102
Fixed Wireless	91	85	44	83	225	372		236	1627		2763
VERIZON	3							1			4
Windstream Missouri, Inc.	79	2	41	67	2	2		9	15		217
Wisper ISP, LLC	3	6		2	197	369		25	1		603
WON Communications LLC	6	77	3	14	26	1		201	1611		1939
Stone County	1189	145	10	24	269	657	100	72	53	263	2782
Cable					18	13	100	69	35	222	457
MCC Missouri LLC								69	35	222	326
Optimum					18	13	100				131
DSL	408		10	24	2	5					449
AT&T Inc	10		6	11	2	5					34
Brightspeed	398		4	13							415
Fiber								3	18	41	62
AT&T Inc									1		1
Brightspeed										1	1
K-PowerNet LLC										11	11
Sho-Me Technologies, LLC									1	1	2
Total HighSpeed Internet Solutions								3	16	28	47
Fixed Wireless	781	145			249	639					1814
T-Mobile US	125	9			86	103					323
UNITED STATES CELLULAR CORPORATI	624				9						633
VERIZON	21				1						22
Wisper ISP, LLC	11	136			153	536					836
Taney County	458	256	2	12	485	970	649	52	51	122	3057
Cable					115	139	648	46	49	122	1119
MCC Missouri LLC						1	1	46	48	121	217
Optimum					115	138	647		1	1	902
DSL	173		2	12							187
Brightspeed	173		2	12							187
Fiber								1	6	2	9
Brightspeed								1	6		7
Sho-Me Technologies, LLC									2		2
Fixed Wireless	285	256			370	831					1742
T-Mobile US	22	4			7	35					68
UNITED STATES CELLULAR CORPORATI	184				48						232
VERIZON	26										26
Wisper ISP, LLC	53	252			315	796					1416

Provider Claimed Speed	Above 25/3; Below 50/10		Above 50/10; Below 100/20		Above 100/20; Below 200/50				Above 200/50		
Maximum Speed Test at Location	Below 10/1	Above 10/1; Below 25/3	Below 10/1	Above 10/1; Below 25/3	Below 10/1	Above 10/1; Below 25/3	Above 25/3; Below 50/10	Below 10/1	Above 10/1; Below 25/3	Above 25/3; Below 50/10	Grand Total
Webster County	767	369	4	10	1042	1823		270	357	448	5090
Cable								122	276	438	836
MCC Missouri LLC								122	276	438	836
DSL	249		4	10							263
Brightspeed	249		4	10							263
Fiber								148	81	10	239
Sho-Me Technologies, LLC								2	4	2	8
Total HighSpeed Internet Solutions								146	77	8	231
Fixed Wireless	518	369			1042	1823					3752
T-Mobile US	157	53			173	159					542
UNITED STATES CELLULAR CORPORATI	247				111						358
VERIZON	20				1						21
Wisper ISP, LLC	94	316			757	1664					2831
Grand Total	5013	1085	257	683	4579	6528	2286	3838	5641	8714	38624

APPENDIX 5

Myths, Realities, and Responses

Successful broadband planning requires collaboration between governments, internet service providers, and consumers. Speed test analysis is an essential part of that collaboration, but some internet service providers may object that the maps are inaccurate. Some of these objections may cite common myths about speed testing, but others will be valid concerns. When sharing this report with providers, the following explanations can help steer the conversation toward collaboration.

MYTHS	Bad tests are because of poor Wi-Fi.	Residents only subscribe to low speed packages.	People only test when there is a problem.
REALITIES	Our analysis eliminates speed tests with weak Wi-Fi and includes tests from GPS-enabled wired devices.	According to NRECA, in areas where rural electric cooperatives offer broadband, 25% to 33% of rural subscribers opt for the top speed offered.	Network problems prompt tests, as do resolutions of problems. Sometimes the tests will show the network is working but a streaming service is slow. We focus on the maximum speed ever shown

Problem: Network throttling

When a provider limits subscriber bandwidth (e.g., 35 or 50 Mbps down instead of 100), then speed test maps will show those customers as underserved, even though the underlying technology can deliver much higher speeds.

Solution: Conduct max speed tests during installation and service calls

ISPs can improve their speed ratings by having their technicians conduct GPS-enabled Ookla speed tests as part of each customer premise visit. When installing new service or completing a repair, the technician should:

- Temporarily remove any bandwidth caps on the customer’s account.
- Connect to the customer’s wi-fi using a GPS-enabled iOS/Android device or plug directly into the fiber interface’s Ethernet port using a GPS-enabled laptop.
- Using the Speedtest by Ookla app with precise location tracking enabled, conduct multiple tests to reveal the fastest speed available. Always use the Ookla app. The speedtest.net website does not gather precise enough location data.

This approach should not be considered “gaming the system.” For grant planning purposes, it is important to document the highest practical speeds available in each area, even if an ISP does not routinely allow customers full access to those speeds.

Problem: Mis-attributed IP address ranges

Smaller ISPs sometimes purchase or lease their network address ranges from a middle mile provider. If those address ranges do not have the ISP's name associated with them, then those tests will be filtered out of the results as belonging to an infrastructure device instead of a home or business.

Solution: Update IP block ownership data

Ookla uses the Maxmind service to identify ISP network address owners. ISPs can update their address attribution by visiting maxmind.com and completing the form found under Correct a GeoIP ISP or Organization.

Problem: Poor upload speeds

Cable modem-based systems can support download speeds as fast as 2 Gbps, but they often struggle to deliver upload speeds above 10 Mbps. This is a fundamental limitation of the medium, especially for older cable TV networks.

Solution: Network upgrade

Cable companies can perform what is known as a "high split upgrade" that increases upload speeds for less than it would cost to deploy fiber. While this is not a long-term solution, it does help older cable plants to meet current federal minimums.

Problem: Recent upgrades not showing up

Because speed test data relies on organic consumer behavior patterns, test results can lag behind network changes, especially when a provider raises or removes a speed cap on its customers' accounts without notifying them.

Solution: Technician-conducted speed tests and customer test campaigns

If an ISP wants to see a more immediate reflection of recent changes to its existing network, they should add speed testing to their technicians' customer premise visit procedure. We also recommend encouraging customers to conduct their own speed tests. As noted above, these tes