APPALACHIAN POWER℠

An AEP Company

BOUNDLESS ENERGY℠

Broadband Feasibility Study

Submitted to the

West Virginia Broadband Enhancement Council

January 9, 2023

Appalachian Power
200 Association Drive
Suite 201
Charleston, WV 25311

Aaron D. Walker
President & COO
304 348-4191
awalker@aep.com

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January 9, 2023

Via Electronic Mail
Robert L. Morris, Jr., Chairman
West Virginia Broadband Enhancement Council
c/o West Virginia Development Office
Attn: Kelly Workman, Director
1900 Kanawha Blvd E
Building 3, Suite 600
Charleston, WV 25305

Dear Chairman Morris:

Attached please find a study prepared by Appalachian Power Company and Wheeling Power Company (the "Companies") which investigates the feasibility of constructing and operating a middle-mile broadband infrastructure expansion project within the counties of McDowell, Mercer, Raleigh, Summers, and Wyoming, all situated within Appalachian Power Company's West Virginia service territory. The Feasibility Study is being submitted to the West Virginia Broadband Enhancement Council for its consideration, in accordance with W. Va. Code § 31G-4-5.

If the Council has any questions regarding this submittal, please do not hesitate to contact the undersigned.

Sincerely,

Enclosure
cc: Kelly Workman

Broadband Feasibility Study #2
Submitted to the West Virginia Broadband Enhancement Council
by Appalachian Power Company and Wheeling Power Company
January 9, 2023

Appalachian Power Company (APCo) and Wheeling Power Company (WPCo) (collectively the Companies) hereby submit this Broadband Project Feasibility Study (Study) to the Broadband Enhancement Council (Council) pursuant to W. Va. Code § 31G-4-5 (b). In support of this filing, the Companies state as follows:

I. Introduction

APCo and WPCo are electric utilities operating within West Virginia and are regulated by the Public Service Commission of West Virginia (Commission). For many years, the Commission has approved uniform rates for the Companies.

The Companies submitted their first Broadband Feasibility Study for a middle-mile broadband infrastructure project,[1] which covered Mingo and Logan Counties, to the Council on October 22, 2019. The Council, on December 12, 2019, unanimously issued a Resolution determining that the Mingo and Logan Counties project was feasible (Resolution).

Much has happened since the Council issued its Resolution. W. Va. Code § 24-2-1p, which established West Virginia's Middle-Mile Fiber Broadband Infrastructure Expansion Program, became law in 2020. That statute addressed the regulatory and legal barriers related to the installation of middle-mile broadband infrastructure projects by West Virginia electric utilities that the Companies identified in their first feasibility study. In that statute, the West Virginia Legislature (Legislature) specifically addressed the public interest, finding, among other things, "That it is in the public interest to expedite

[1] Middle-mile refers to the back-bone infrastructure connecting an Internet service provider's (ISP) last-mile service network to the global Internet. The middle-mile is analogous to a highway, with the last-mile being the side roads.

construction of middle-mile fiber broadband infrastructure to provide the necessary architecture to facilitate additional broadband Internet access to individuals and institutions in unserved areas of the state; and ... That it is appropriate to establish a program to allow electric utilities to construct middle-mile fiber broadband assets within the power supply zone utilizing existing and new electric utility distribution assets in a manner that addresses the needs of the public and is consistent with the operational concerns of the electric utilities that may participate in this program." W. Va. Code §§ 24-2-1p (a)(6) and (7).

In accordance with W. Va. Code § 24-2-1p, on January 20, 2021, the Companies filed their written plan for approval of the Mingo and Logan Counties project with the Commission. By Order dated June 16, 2021, in Case No. 21-0032-E-IMM, the Commission approved that project, which is currently under construction.

The purpose of this second feasibility study is to propose another middle-mile broadband infrastructure project within APCo's service territory in the Counties of Raleigh, Mercer, Wyoming, McDowell, and Summers, and to seek a determination from the Council of the feasibility of the Project. W. Va. Code § 31G-4-5 (b) and (e). These five counties will sometimes be referenced as "the Counties" throughout this document.

The West Virginia Legislature made a number of findings when it enacted Chapter 31G of the West Virginia Code, which governs this submittal. Among those findings were the following:

- The lack of affordable, accessible broadband service in the underserved and unserved areas in this state necessitates consideration of alternative means and methods of providing Internet services (W. Va. Code § 31G-2-3 (a)(2));
- That although broadband access has been extended to many of West Virginia's cities, towns and other concentrated population areas, some areas of the state, mostly rural, remain unserved (W. Va. Code § 31G-1-1 (2)); and

- It is a primary goal of the Governor, the Legislature, and the citizens of this state to make every municipality, community, and rural area in this state, border to-border, accessible to Internet communications through the expansion, extension and general availability of broadband services and technology (W. Va. Code § 31G-1-1 (1)).

Based upon these findings, the Legislature has declared that one of its purposes is "to provide for the development of policies, plans, processes, and procedures to be employed and dedicated to extending broadband access to West Virginians, and to their families, by removing restraint on the development of those services and for encouraging and facilitating the construction of the necessary infrastructure to meet their needs and demands." W. Va. Code § 31G-1-1 (5). To this end, the Legislature created the Council to "[e]xplore any and all ways to expand access to broadband services, including, but not limited to, middle mile, last mile and wireless applications." W. Va. Code § 31G-1-4 (a)(1). The Council is authorized to receive and render a determination on feasibility studies, such as this one, proposing a middle-mile broadband infrastructure expansion project to be constructed and operated by an electric utility within its West Virginia service territory.

The Legislature has also adopted a specific definition of broadband or broadband service, as follows:

> "Broadband" or "broadband service" means any service providing advanced telecommunications capability with the same downstream data rate and upstream data rate as is specified by the Federal Communications Commission and that does not require the end-user to dial up a connection, that has the capacity to always be on, and for which the transmission speeds are based on regular available bandwidth rates, not sporadic or burstable rates, with latency suitable for real-time applications and services such as voice-over Internet protocol and video conferencing, and with monthly usage capacity reasonably comparable to that of residential terrestrial fixed broadband offerings in urban areas: Provided, That as the Federal Communications Commission updates the downstream data rate and the upstream data rate the council will publish the revised data rates in the State Register within sixty days of the federal update. W. Va. Code § 31G-1-2 (1).

The use of the phrase "with monthly usage capacity reasonably comparable to that of residential terrestrial fixed broadband offerings in urban areas" in this definition, coupled with the

requirement that any proposed project submitted to the Council by an electric utility pursuant to W. Va. Code § 31G-4-5 (b) shall include "[t]he method of attachment and connection of the middle-mile broadband fiber assets to the electric utility's distribution infrastructure" (emphasis added; see W. Va. Code § 31G-4-5 (d)(1)(D)), indicates the Legislature's clear intention that any middle-mile broadband infrastructure expansion project proposed by an electric utility under W. Va. Code § 31G-4-5 (b) should be based upon fiber optic cable. This is consistent with the Federal Communications Commission's (FCC) conclusion that "mobile services are not currently full substitutes" for fixed service.[2] The 2021 FCC performance benchmark for fixed terrestrial-based broadband speed is 25 megabits per second (Mbps) download and 3 Mbps upload.[3] Given these considerations, in this Study, the term "broadband" refers to the current FCC definition of 25 Mbps download and 3 Mbps upload speeds using a fiber optic cable as the middle-mile broadband infrastructure.

Regulated electric utilities, such as the Companies, are uniquely positioned to play a key role in the expansion of middle-mile broadband infrastructure into rural West Virginia, as recognized by the Legislature. To begin with, they already have a distribution infrastructure (consisting of poles and wires) in place that is used to provide electric service to their rural customers (distribution system). In the case of the Companies, they also have over 30 years of experience deploying fiber optic cable for use as an internal communications system within their service territories.[4] While additional fiber optic cable is currently being deployed to provide more robust communications and greater connectivity to transmission substations and other transmission assets, as demonstrated by the Mingo and Logan Counties project currently under construction, it can be extended into rural areas of West Virginia by

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[2] 2021 Broadband Deployment Report, Section III. A.10., Defining Advanced Telecommunications Capability, FCC 21-18 (January 19, 2021).

[3] *Id.* at Section III. A. 12.

[4] Throughout this study, the Companies refer to fiber optic cable as a communications system or platform. Those phrases are intended to cover a broad range of critical connectivity needs of the Companies, including, but not limited to, such things as Supervisory Control and Data Acquisition (SCADA), protective relaying, security, communications to and from transmission and distribution centers, and inter-facility voice, data and video communications.

attaching fiber optic cable along some portions of the Companies' distribution system. Because Section 235 of the National Electrical Safety Code (NESC) permits electric utilities to connect fiber optic cable used for their communication needs in the "power supply zone," electric utilities can cost-effectively and efficiently install such fiber optic cable.[5] Given these facts, the Companies have the required capability to manage both the costs and complexity of constructing and operating the proposed middle-mile broadband infrastructure expansion project in APCo's West Virginia service territory.

It is also in the public interest to encourage the installation of fiber optic cable on the Companies' distribution systems. The Legislature already determined that extending broadband Internet service into rural West Virginia is in the public interest, and passed enabling legislation allowing electric utilities like the Companies to propose installing fiber optic cable along portions of their distribution system to provide the middle-mile infrastructure necessary to reach this goal.

In addition, the Companies have embarked on a program of distribution grid modernization designed to improve the reliability of their West Virginia customers' electric service. It is possible to modernize the distribution grid currently without the use of a fiber optic cable communications system. While such a system would be more costly than other available options, it would provide a more robust, secure and "future-proof" (i.e. longer lasting) communications system. Finally, the combination of high-speed Internet and improved electric reliability in rural areas of the Companies' service territories would provide the opportunity for increased economic development in those areas. West Virginia, its communities, and its citizens have suffered from the impacts of job loss and economic upheaval over a number of years, and it is in the public interest to encourage economic development to help restore jobs and improve opportunities for West Virginians. Bringing broadband Internet service, in combination

[5] Only electric utilities are permitted to install fiber optic cable for communication purposes 12 inches below the distribution neutral in the "power supply zone" or "supply space;" other attachers frequently face higher installation costs because, for safety reasons, they are required to install cable in the "communications space" below the power supply zone, which may result in the need to replace more existing poles with taller ones to obtain the needed height. (see Exhibit 1).

with improved electric reliability to rural West Virginia, would improve opportunities for economic development and entrepreneurial ventures. Because economic development tends to increase electric usage, any increase in load would allow the Commission to spread the Companies' fixed costs, which are necessary to provide, maintain and improve electric service, over more units, thereby potentially reducing customer rates, or at least limiting future rate increases.

Section II of this Study describes the Companies' second middle-mile broadband infrastructure expansion project, proposed to be constructed in five adjoining Counties within APCo's West Virginia service territory, and evaluates that project in accordance with the provisions of W. Va. Code § 31G-4-5 (d). Given the Council's responsibilities under W. Va. Code § 31G-4-5(f), as well as its determinations set out in its December 12, 2019 Resolution, Section III of this Study sets out the following: the Companies' thoughts regarding the identification of one or more last-mile broadband Internet service providers, sometimes referred to as ISPs, and perhaps other potential users of the middle-mile broadband infrastructure that APCo proposes to construct and operate as part of its second middle-mile broadband infrastructure project; and their suggestions regarding how to develop the lease terms and conditions for the proposed project to be approved by the Council.

The Companies are requesting that the Council render a decision on the feasibility of their second proposed project within the statutorily required 60-day period (W. Va. Code § 31G-4-5 (g)). However, it should be recognized that the Companies will not be able to make the appropriate regulatory filing to move the proposed project forward until one or more ISPs, which may lease the middle-mile broadband Internet capacity to be created by the proposed project, have been identified; APCo has had an opportunity to work with those entities to refine the parameters of the proposed project and develop lease terms and conditions, including the level of lease payments and maintenance fees to be paid by such entities to APCo; and the Council has approved those terms and conditions.

II. Proposed Project

Pursuant to W. Va. Code § 31G-4-5 (b), the Companies are proposing a middle-mile broadband infrastructure expansion project in the five adjoining Counties, which are within APCo's West Virginia electric service territory. As required by W. Va. Code § 31G-4-5 (d), this section of the Companies' Study provides an evaluation of the following:

(1) The scope of the proposed project, which shall include, but not be limited to:
   (A) The route of the middle-mile infrastructure proposed for the project, the number of fiber strands that would be utilized in connection with the proposed project and dedicated to serve as the middle-mile, the location of the electric utility's distribution infrastructure that will be utilized in connection with the proposed project, the capacity of the middle-mile broadband infrastructure that will be available to lease to last-mile broadband Internet providers upon completion of the proposed project;
   (B) The estimated costs of the proposed project, including but not limited to engineering costs, construction costs, permitting costs, materials and labor, right-of-way costs and a reasonable rate of return to the electric utility;
   (C) The proposed schedule of construction of the proposed project; and
   (D) The method of attachment and connection of the middle-mile broadband fiber assets to the electric utility's distribution infrastructure.

(2) The regulatory and legal barriers to an electric utility to make improvement to the distribution grid in furtherance of providing such middle-mile broadband Internet services in conjunction with its program of electric distribution projects;

(3) Whether it is in the public interest and the interest of the electric utility to make improvements to the distribution grid in furtherance of providing such middle-mile broadband Internet services in conjunction with its program of electric distribution projects;

(4) Whether it is in the public interest and the interest of the electric utility to operate middle-mile-broadband Internet assets to provide access to unserved and underserved areas of the state;

(5) Whether it is in the public interest and the interest of the electric utility to permit a third party to lease such capacity to provide last-mile broadband Internet services to unserved and underserved areas of the state;

(6) Whether construction of middle-mile broadband Internet infrastructure utilizing electric utility distribution systems is feasible with respect to the maturity of the relevant technology, the compatibility of such services with existing electric services, and the financial requirements to undertake such project;

(7) The anticipated level of rate adjustment necessary to allow the electric utility to recover its costs associated with the proposed project, and a reasonable rate of return, on an expedited basis, that will be recovered by the electric utility through a rate adjustment at the Commission; and

(8) Such other information that is pertinent to the project.

While all of these aspects are covered in this section, they may be addressed in a somewhat different order for ease of presentation.

A. Scope of the Proposed Project (W. Va. Code §§ 31G-4-5(d) (1) (A) and (D))

The Counties were chosen for this middle-mile broadband infrastructure project based upon the following considerations:

- The Federal Communications Commission (FCC), in its 2021 Broadband Deployment Report found that the percentages of 25/3 Mbps or greater broadband coverage in the Counties were 89.3% (Raleigh), 94.2% (Mercer), 92.6% (Wyoming), 87.5% (McDowell), and 54.6% (Summers). The FCC is in the process of updating its maps. The FCC's method of mapping broadband coverage has been widely criticized as imprecise, inaccurate and unreliable by consumers, trade associations, lawmakers, other industry stakeholders, and even some of its own members. Due to these known concerns, APCo commissioned the Blue Ridge Advisory Services Group to identify and map areas of coverage in the Counties. The Blue Ridge study found that approximately 41% of households in the Counties do not have access to adequate broadband coverage. (See Exhibit 2).

- As of October 2022, APCo has approximately 101,410 residential and business electric customers in the Counties. All five of the Counties are predominately rural.

- Fiber optic cable has been, and over the next few years will continue to be, installed to link transmission assets in the Counties, including substations that have transmission assets (transmission substations), in order to improve the reliability of APCo's electric grid. A middle-mile project in these Counties that utilizes a portion of the strands in that fiber optic cable would realize efficiency benefits in both a reduction in installation time and reduced project costs.

- These Counties are Appalachian Regional Commission (ARC)-designated distressed and at-risk counties affected by the decline of the coal industry.[6] Key economic indicators in the Counties, such as unemployment, per capita market income and poverty rates have shown the need to stimulate economic growth and improve the standard of living through technology related avenues. As such, bringing high speed Internet to the Counties, in combination with increased electric reliability, will encourage economic development and potentially increase APCo's electric load, to the benefit of the Companies' electric customers.

[6] County Economic Status and Number of Distressed Areas in West Virginia, Fiscal Year 2023, Appalachian Regional Commission, June 2022, https://www.arc.gov/wp-content/uploads/2022/06/CountyEconomicStatusandDistressAreasFY2023WestVirginia.pdf.

The fiber optic cable that APCo would install in the Counties as its proposed middle-mile broadband infrastructure expansion project would primarily be used for the Companies' internal communication needs. The proposed project will consist of a total of 955 miles of fiber within the Counties, 658 miles of which will be new installation of 96-strand fiber optic cable and 297 miles of which will utilize strands in existing fiber on APCo's infrastructure within the Counties.

The proposed fiber would provide a robust communications platform to support APCo's current and future deployment of grid modernization initiatives in its service territory within the Counties. The proposed project will enhance the reliability and security of the Companies' communications network and provide a middle-mile broadband infrastructure in the Counties comparable to that approved by the Commission in Mingo and Logan Counties, which, consistent with the Resolution, was informed by the receipt of bids and proposals of ISPs for that project. A map showing the proposed project, and the location of APCo's distribution infrastructure that would be utilized in connection with it, is attached as Exhibit 3.

The Counties are currently served by several ISPs, including A&A Communications, Comcast, and Citynet, which could potentially extend Internet service further into those counties as a result of the proposed project. There may also be additional potential users of "dark fiber" that would become available under the Companies' proposed project. The Companies will assist the Council with its required task, per W. Va. Code § 31G-4-5(f), of identifying one or more last-mile ISPs, or others, that may lease part or all of the middle-mile broadband Internet capacity that would be created by the proposed project.

B. Cost of the Proposed Project and Anticipated Level of Needed Rate Adjustment (W. Va. Code §§ 31G-4-5 (d) (1) (B) and (d) (7))

The Companies have developed preliminary estimates of both the initial capital investment that

APCo would need to make to install the proposed project and the associated annual operation and maintenance (O&M) expense. The costs include a preliminary estimate of the appropriate share of the costs of the fiber optic cable already planned to be installed to link APCo's transmission substations within the Counties, as well as the existing fibers to be utilized as part of the proposed project. Table 1, below, provides a summary of these costs.

Table 1	
Description:	Proposed Project
New Fiber Miles	658
Existing Fiber Miles	297
Total Fiber Miles	955
Total Estimated Initial Capital Investment	$113.6M
Total Estimated Annual O&M Expense	$3.4M

These costs are for the fiber optic cable communications platform only, which includes necessary mounting, hardware, splice enclosures, and fiber optic cable drop locations into the communications space, but not such things as the cost to reconfigure circuits, or to purchase equipment related to grid modernization.

The capital cost estimates depicted in Table 1 factor in the challenging terrain in the Counties. While they are not broken out separately, the capital costs in Table 1 also reflect estimates of preliminary engineering costs, any expected permitting costs, materials (including necessary hardware), labor, telecommunications buildings to hub (i.e. house) ISP electronics, and right-of-way costs. Once the Council has found the proposed project to be feasible, the Companies will be in a position to further refine these estimates. The Companies are committed to working with the Council, the Commission, and all other interested parties, and to do so in a timely manner.

Based upon the initial capital investment and annual O&M expense shown on Table 1, the Companies developed an estimate of the ongoing annual revenue requirement upon project completion (excluding consideration of yet unknown lease payments and maintenance fees). The estimated annual

revenue requirement for the proposed project, as shown in Exhibit 4, would be approximately $20 million. This amount reflects the Companies' pre-tax rate of return of 7.058% (based on their combined December 31, 2021 capital structure and a 9.75% authorized return on common equity), and represents the anticipated level of rate adjustment (excluding consideration of yet unknown lease payments and maintenance fees) that would be necessary for APCo to recover the costs associated with the proposed project over approximately 30 years. Using a cost allocation methodology consistent with one previously approved by the Commission in its Order in Case No. 21-0032-E-IMM , pursuant to W. Va. Code § 24-2-1p (j)(1), the Companies estimate the bill impact on residential customers using 1,000 kWh a month to be as follows: $2.64 per month, or about $31.69 per year for the proposed project.

The estimated revenue requirements and residential bill impacts described above do not reflect any lease revenues or maintenance fees that APCo would receive from ISPs or other potential broadband lessees. As required by W. Va. Code § 24-2-1p (j)(5), all such lease revenues and maintenance fees will be credited by the Companies to the cost-of-service when the Commission establishes any revenue requirement and rates associated with constructing the project and operating the middle-mile broadband infrastructure.[7]

The Companies recognize that W. Va. Code § 31G-1A-2 (c) authorizes the Office of Broadband to seek non-state funding and grants to support and fund projects and initiatives in furtherance of broadband expansion in West Virginia. For their part, the Companies have applied for federal funding for the proposed project. The Companies commit to work with the Council to ensure that any grants and/or funding that they or the Office of Broadband might obtain are used to further this legislative goal. Once grants are awarded, the Companies will be in a better position to determine the impact, if any, that such grants have on the cost of the proposed project.

[7] Once lease terms are negotiated and approved by the Council, as envisioned in the Resolution, the Companies will be in a better position to estimate the level of lease revenues and maintenance fees that would be credited to cost-of-service.

C. Regulatory and Legal Barriers; Public Interest; and Feasibility (W. Va. Code §§ 31G-4-5 (d)(2) through (6))

In their first feasibility study for the Mingo and Logan Counties project, as required by W. Va. Code § 31G-4-5 (d)(2), the Companies identified a number of regulatory and legal barriers that needed to be addressed before electric utilities could proceed with middle-mile broadband infrastructure projects in West Virginia.[8] As indicated in the Introduction to this Study, the passage of W. Va. Code § 24-2-1p in 2020 adequately addressed those concerns, and the Companies are unaware of any other regulatory or legal barriers at this time.

W. Va. Code §§ 31G-4-5 (d)(3), (4) and (5) require that any electric utility that investigates the feasibility of constructing and operating a middle-mile broadband infrastructure project within its electric distribution system shall evaluate whether it is in the public interest, and the interest of the electric utility, to do the following:

- make improvements to the distribution grid in furtherance of providing such middle-mile broadband Internet services in conjunction with its program of electric distribution projects;
- operate middle-mile broadband Internet assets to provide access to unserved areas of the state; and
- permit a third party to lease such capacity to provide last-mile broadband Internet services to unserved areas of the state.

In addition, W. Va. Code § 31G-4-5(d)(6) requires an evaluation of whether the proposed project is feasible with respect to the maturity of the relevant technology, the compatibility of such services with existing electric services, and the financial requirements to undertake such project.

[8] *See* Broadband Feasibility Study at 20-23, Appalachian Power Co. & Wheeling Power Co. (2019). https://broadband.wv.gov/wp-content/uploads/2019/10/AEP-WV-Broadband-Feasibility-Study.pdf

Several events that have occurred since October 2019, when the Companies submitted their first feasibility study to the Council, demonstrate why the proposed project is in the public interest, in the interest of the Companies and their electric customers, and feasible. To begin with, the Council's December 12, 2019 Resolution determined that the Companies' first broadband project was feasible, and the Commission approved this project, which is currently under construction. In addition, when it enacted W. Va. Code § 24-2-1p in 2020, the Legislature specifically found "That it is in the public interest to expedite construction of middle-mile fiber broadband infrastructure to provide the necessary architecture to facilitate additional broadband Internet access to individuals and institutions in unserved areas of the state; and ... That it is appropriate to establish a program to allow electric utilities to construct middle-mile fiber broadband assets within the power supply zone utilizing existing and new electric utility distribution assets in a manner that addresses the needs of the public and is consistent with the operational concerns of the electric utilities that may participate in this program." W. Va. Code §§ 24-2-1p (a)(6) and (7). Given that the proposed project is tailored after the Companies' first project, it is both feasible and in the public interest.

D. Proposed Construction Schedule (W. Va. Code § 31G-4-5 (d)(1)(C))

There are a number of "next steps" that will need to be completed before the proposed project can move forward, even after it is determined to be feasible by the Council. The expected length of those steps has been informed by the Companies' experience with its first project. The Companies estimate that it will take approximately six months to negotiate the lease terms and conditions with one or more ISPs identified by the Council, have those lease terms approved, and prepare the necessary application to submit to the Commission. By law, the Commission has 150 days from the application filing date to rule on the Companies' filing. If the filing is approved, the Companies estimate that it will take approximately six months to conduct the pre-engineering process, which includes site visits, reviewing the route with the last-mile provider and procuring the necessary materials for the project.

Once construction starts, the Companies estimate that it will take from 18 to 30 months to complete the proposed project.

III. Identification of Third-Party Lessees and Determination of Lease Terms and Conditions (W. Va. Code § 31G-4-5 (f))

W. Va. Code § 31G-4-5 (f) provides that, as part of its consideration of a middle mile broadband infrastructure expansion project proposed by an electric utility, the Council shall (1) identify one or more last-mile broadband providers that may lease the middle-mile broadband capacity created by the proposed project; and (2) set the lease terms and conditions under which the middle-mile broadband capacity created by the proposed project may be leased by such entities. As was the case with their first project, the Companies commit to work with the Council to identify potential lessees for the fiber optic cable broadband infrastructure that would be created by the proposed project, if it is determined to be feasible by the Council. Consistent with the approach outlined in the Council's 2019 Resolution, once such lessees are identified, the Companies intend to negotiate the lease terms and conditions under which APCo would lease broadband capacity created by the proposed project to those entities, subject to the Council's approval. From the Companies' perspective, the general terms and conditions contained in the Appendix to the Resolution continue to provide guidance regarding the negotiation of such terms and conditions.

As described above, the Companies have identified a 96-strand fiber optic cable as the cost-effective cable size to install as part of the proposed project. Making the broadband capacity to be created by the proposed project available to as many lessees as possible would have a number of benefits. Doing so would maximize not only the potential use of as many of the available strands as possible, but also the amount of lease revenues and maintenance fees that APCo would collect from the

lessees, which APCo would credit to its electric cost-of service when the Commission establishes the revenue requirements and rates associated with the proposed project.

IV. Conclusion

The Companies appreciate the opportunity to submit this Feasibility Study to the Council for its consideration. As required by W. Va. Code § 31G-4-5 (e), the Companies understand that the Council will post this Study on its website for written public comment. The Companies request that they be given a reasonable opportunity to respond to such comments. The Companies further request that the Council render its determination of the proposed middle-mile broadband infrastructure expansion project described and evaluated in this Study within 60 days of its submittal date, as required by W. Va. Code § 31G-4-5 (g).

Throughout this process, the Companies pledge to work with the Council to identify one or more last mile broadband internet providers, and potentially other entities, that could lease middle-mile broadband capacity to be installed by APCo under the proposed project; and thereafter to negotiate the lease terms and conditions under which ISPs and potentially others would lease middle-mile capacity from APCo, subject to the Council's approval, with the goal of subsequently submitting a written plan to the Commission for the approval and cost recovery of the proposed project, as required by W. Va. Code § 24-2-1p (f).

Respectfully submitted,

Aaron D. Walker
President and COO
Appalachian Power Company and Wheeling Power Company

Exhibit Descriptions

Exhibit 1 - Utility Pole Diagram

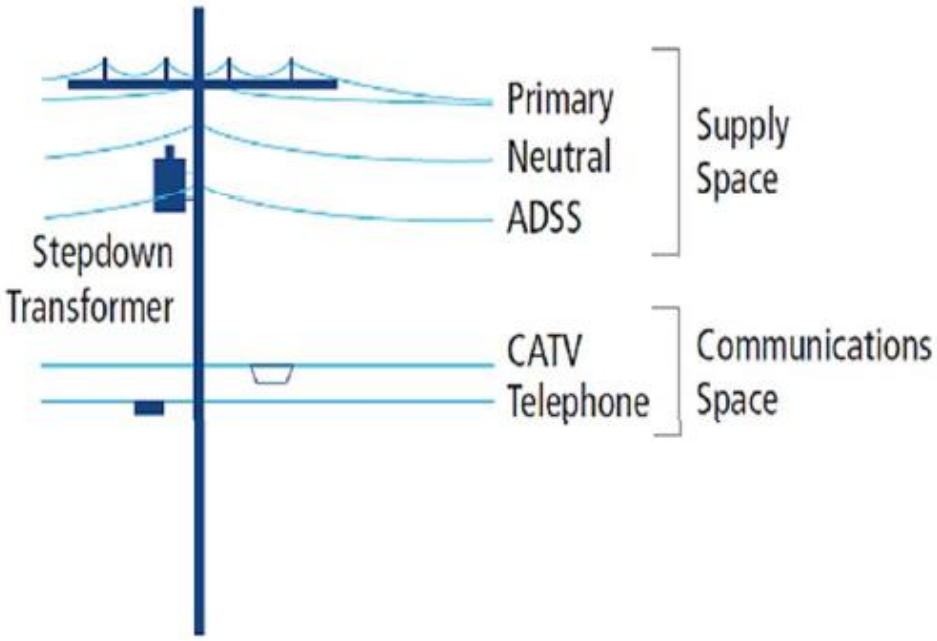
Exhibit 2 – Blue Ridge Survey

Exhibit 3 – Map of Proposed Project

Exhibit 4 –Annual Revenue Requirement for Proposed Project

Exhibit 1

Utility Pole Diagram



Note: ADSS stands for All Dielectric Self Supporting (Fiber Optic Cable)

Broadband Assessment of Region One West Virginia

Project Report For Appalachian Power Company

January 2022

Prepared by

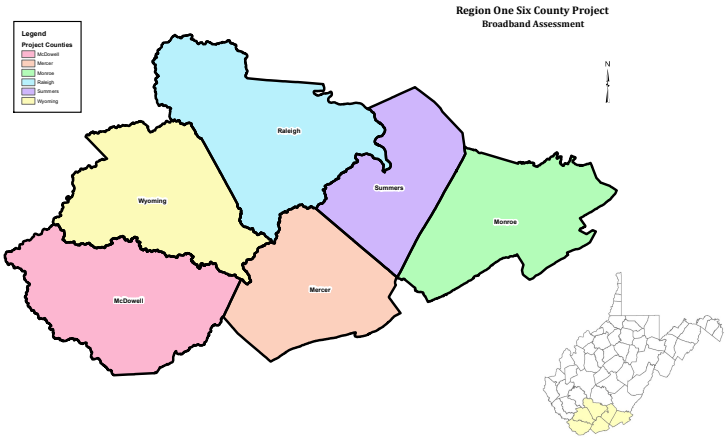
BRASG
BLUE RIDGE ADVISORY SERVICES GROUP

Blue Ridge Advisory Services Group
Post Office Box 501 Blowing Rock, NC 28605
828.963.7636
www.blueridge-group.com

1 Table of Contents

2 Executive Summary

This project report was written for Appalachian Power Company and documents findings and maps from a broadband study of served and unserved areas in McDowell, Mercer, Monroe, Raleigh, Summers, and Wyoming Counties in West Virginia (Region One). This study was conducted primarily in the Fall of 2021 by Blue Ridge Advisory Services Group (Blue Ridge), a broadband consulting firm.



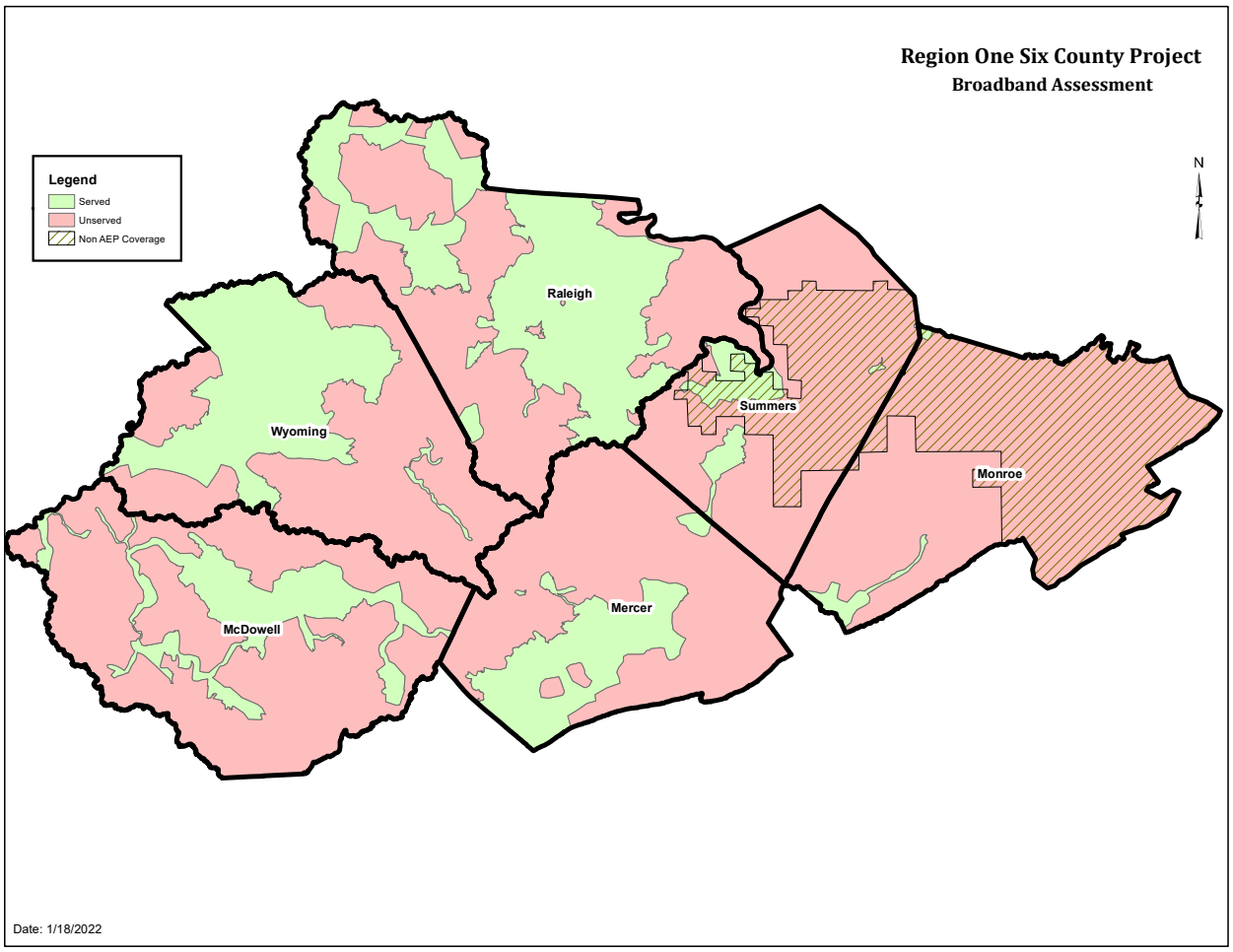
The project objective was to identify and map specific geographic areas within Region One that are served and unserved. This project and its objective align with Appalachian Power's strategy to evaluate markets in its service territory for potential expansion of its middle mile broadband service to unserved customers through partnerships with last mile providers.

Blue Ridge approached the scope of work by developing internet-based surveys for each county that were widely distributed throughout the communities and by conducting diagnostic interviews with key stakeholders. Blue Ridge analyzed, categorized, and mapped nearly 2,500 survey responses. Any unknown areas were verified with county leaders or through an onsite field-verification process to make the determination of served or unserved.

A summary of the study area is outlined in the following table, including the total estimated population (just over 194,000) and the total estimated number of households (almost 84,000). We received nearly 2,500 survey response. The total number of households that we would consider unserved for Region One is 23,631. Mercer County represents almost a third of that total with 6,515 households unserved.

County	Population	Households	Responses	Served	Unserved	Est.No. of Households Unserved
McDowell	17,186	7,604	276	57%	43%	3,270
Mercer	58,381	25,056	502	74%	26%	6,515
Monroe	13,250	5,687	489	23%	77%	4,379
Raleigh	72,774	31,368	662	88%	12%	3,764
Summers	12,431	5,782	203	33%	67%	3,874
Wyoming	20,047	8,318	360	78%	22%	1,830
Total/Average	**194,069**	**83,815**	**2,492**	**59%**	**41%**	**23,631**

The map below illustrates the overall served (in green) and unserved (in red) findings for each county in Region One. The diagonal lines in Summers Co. and Monroe Co. represent areas outside of Appalachian Power's service territory. A large portion, as a percentage of population, as illustrated in the map in red, is unserved (an average of approximately 41% of the region).



3 Introduction

This project report was written for American Electric Power's (AEP) subsidiary Appalachian Power Company (Appalachian Power). The report documents findings and maps from a broadband study of served and unserved areas in McDowell, Mercer, Monroe, Raleigh, Summers, and Wyoming Counties in West Virginia (the Region One Planning and Development Council). This study was conducted primarily in the Fall of 2021 by Blue Ridge Advisory Services Group (Blue Ridge), a broadband consulting firm.

The study is part of Appalachian Power's strategy to evaluate markets in its service territory for potential expansion of its middle mile broadband service to unserved customers through partnerships with last mile providers.

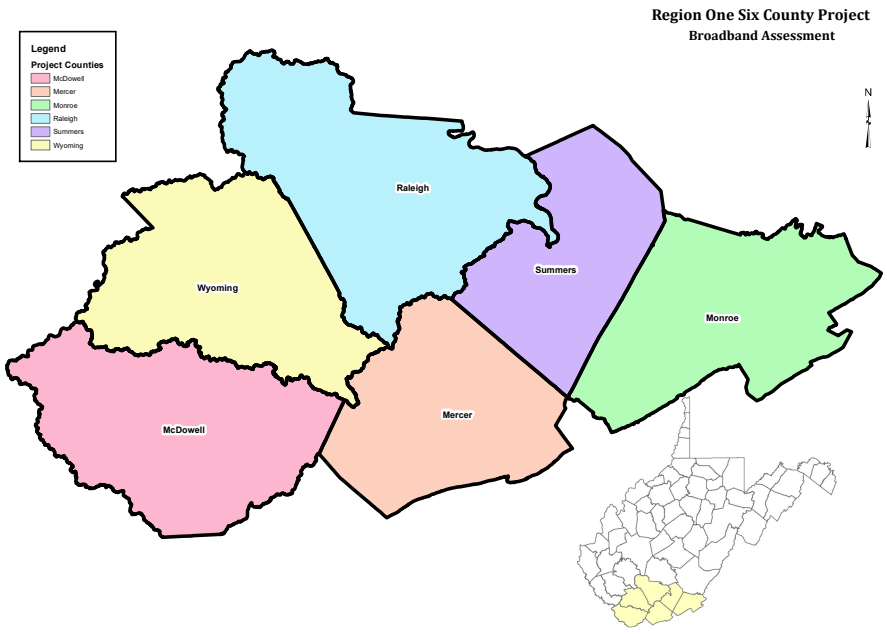
The definition of "unserved" used in this study is in accordance with the West Virginia code from Chapter 31G Broadband Enhancement and Expansion Policies; specifically, section 31G-1-2 definition as follows:

> *"Broadband" or "broadband service" means any service providing advanced telecommunications capability with the same downstream data rate and upstream data rate as is specified by the Federal Communications Commission and that does not require the end-user to dial up a connection, that has the capacity to always be on, and for which the transmission speeds are based on regular available bandwidth rates, not sporadic or burstable rates, with latency suitable for real-time applications and services such as voice-over Internet protocol and video conferencing, and with monthly usage capacity reasonably comparable to that of residential terrestrial fixed broadband offerings in urban areas: Provided, That as the Federal Communications Commission updates the downstream data rate and the upstream data rate the council will publish the revised data rates in the State Register within sixty days of the federal update.*

3.1 Project Area

The following counties, located in the service area of the Region One Planning and Development Council in southern West Virginia, were addressed in this study:

- McDowell County
- Mercer County
- Monroe County
- Raleigh County
- Summers County
- Wyoming County



Key demographic factors on the areas studied are outlined in the following table. The total population of the area of interest is approximately 194,000, with approximately 84,000 households. Most of the counties in Region One were found to follow the same trend of other counties in West Virginia and Southwest Virginia – declining populations (double digit in some) affecting workforce availability, fewer households per square mile, and lower than average household incomes. The rural, mountainous terrain poses a challenge for most broadband providers to achieve profitability, resulting in a lack of broadband coverage and a detrimental effect on the quality of life in the region. Industries are transitioning and economies are lacking the means to grow. Home businesses cannot perform services or fulfill business requirements. Small business cannot compete. Larger businesses are moving out of the region. Not all of these issues are caused by the lack of broadband services, but it is certainly a contributing factor.

Key Factors	Area Total/Avg	McDowell	Mercer	Monroe	Raleigh	Summers	Wyoming	WV	USA
Population 2021 (est.)	**194,068**	17,186	58,381	13,250	72,774	12,431	20,047	1,787,071	333,710,277
Population Percent Change from 2010-2019	**-10%**	-20%	-6%	-2%	-7%	-10%	-14%	-3%	6%
Total Households for Area of Interest (est.)	**83,815**	7,604	25,056	5,687	31,368	5,782	8,318	738,459	127,370,335
Households with Broadband Internet (est.)	**70%**	66%	71%	69%	76%	64%	75%	76%	83%
Median Household Income (2018)	**$38,546**	$27,682	$40,784	$38,540	$43,748	$38,187	$42,332	$46,711	$62,843
Economic Index (Income Relative to WV)	**83%**	59%	87%	83%	94%	82%	91%	100%	100%
Economic Index (Income Relative to US)	**61%**	44%	65%	61%	70%	61%	67%	74%	100%
Businesses (estimate)	**3,279**	129	1,037	141	1,596	132	243	35,795	7,959,103
Employment (estimate)	**50,259**	1,671	17,233	1,292	26,416	1,353	2,294	554,433	132,989,428

Source: US Census Data Quick Facts

3.2 Project Objectives, Scope, & Approach

The ultimate project objective was to identify and map specific geographic areas within Region One that are both served and unserved. A secondary objective was to produce unimpeachable results in the event our findings are challenged before the Public Service Commission of West Virginia.

Blue Ridge accomplished this using a simple, two-part approach:

1. Internet Surveys, and
2. Diagnostic Interviews

3.2.1 Internet Surveys

The survey was brief and had a single mission – to gather enough data, including address data that could be mapped, to determine if a household was served or unserved. The survey was distributed online via social media outlets, county websites, economic development websites, school mailing lists, and other media. Blue Ridge engaged county administrators, libraries, schools, and EMS to assist with posting surveys for each county. Surveys were live over the course of 45 to 60 days (depending on the response rate) until we were confident that we had produced a sufficient sample size to yield a confidence level of 95% with a confidence interval of +/- 5%. Hardcopies of the survey were also made available to be distributed through schools,

county government offices, and/or libraries. Each survey response (nearly 2,500 in total for the region) was analyzed, individually categorized, and mapped as either served or unserved.

Any unknown areas were verified by conducting additional research as well as onsite field work, which included visiting convenience stores, gas stations, general merchandise stores and post offices to interview individuals to determine the provider of internet service (if any) and to assess the quality of service. We also looked for indicators of broadband service, such as outside plant, buried fiber markers, aerial slack loops, and cable pedestals. Additionally, we observed homes with satellite dishes which were considered unserved. This process resulted in zero "hybrid" or "unknown" areas.

The criteria that Blue Ridge used for each category (served or unserved) and for mapping included:

- **Service** – Whether the household had service or not, and, if not -- why?
- **Provider** – Type of provider and its technology; DSL, satellite, and hot spot providers were generally considered unserved whereas cable provider customers were generally considered served.
- **Speed** – Speed test results below 25 x 3 would generally be considered unserved.
- **Comments** – Any additional insights that might be useful in determining whether a household is served or unserved (a costly network line extension on one's street, for example).
- **Reliability & Satisfaction** – Good indicators of service levels.
- **Service Address** – Any survey responses that contained invalid addresses, incomplete addresses, or duplicate addresses were removed from the mapping process.

3.2.2 Diagnostic Interviews

As part of the diagnostic interview process, we met with local stakeholders from the following fields:

- Local County Government and Region One Leaders
- Emergency Management Services and 911 Directors
- Educators
- Librarians
- Business and Economic Development Leaders
- Service Providers

Blue Ridge worked with this cross-functional management group of regional leaders to identify current service levels, needs of the specific communities, and enlist their assistance in distributing the online surveys and promote participation.

Finally, Blue Ridge developed maps of each county of the areas deemed either served or unserved. Areas where no survey results were fielded, we relied on the information provided by

county leaders in the diagnostic interviews and field-verification trips to make the determination of served or unserved.

3.3 Timeline & Deliverables

The project began in August 2021 and was finalized in January 2022. The following graphic shows the project timeline and key milestones.

AEP West Virginia Project - Broadband Study						
Proposed Schedule						
	Aug-21	Sep-21	Oct-21	Nov-21	Dec-21	Jan-22
Project Kickoff						
Internet Surveys						
Diagnostic Interviews						
Mapping						
Management Presentation						
Preparation and Delivery of All Work Papers						

The final deliverables of this project include:

- GIS map layers of the served and unserved areas for each County in Esri ArcMap Polygon Shapefile format (preliminary files delivered via email to client December 17, 2021)
- Kickoff Meeting / Presentation (via Microsoft Teams on August 5, 2021)
- Project Update Meeting / Presentation (via Microsoft Teams on November 17, 2021)
- Final Report Presentation (via Microsoft Teams on December 16, 2021)
- Written report in PDF format (January 2022), which includes PDFs of final mapping

This written report includes, for the region and for each county, the key findings from the surveys and interviews and the final maps of served and unserved areas. All other project deliverable files outlined above will accompany this report.

All work products are the property of AEP and Appalachian Power.

4 Region One

4.1 Key Findings

A summary of the survey results is outlined in the following table, including the total estimated population (just over 194,000), the total estimated number of households (almost 84,000), the number of responses received (~2,500), the confidence interval (with the goal of generating a sample size that yields a confidence level of 95% with a confidence interval of +- 5%). The table also includes final estimates on the percentage of the county that is served and unserved (average of 41%, or more than 23,000 households). Monroe County had the highest percentage of households unserved at 77%, or 4,379 households.

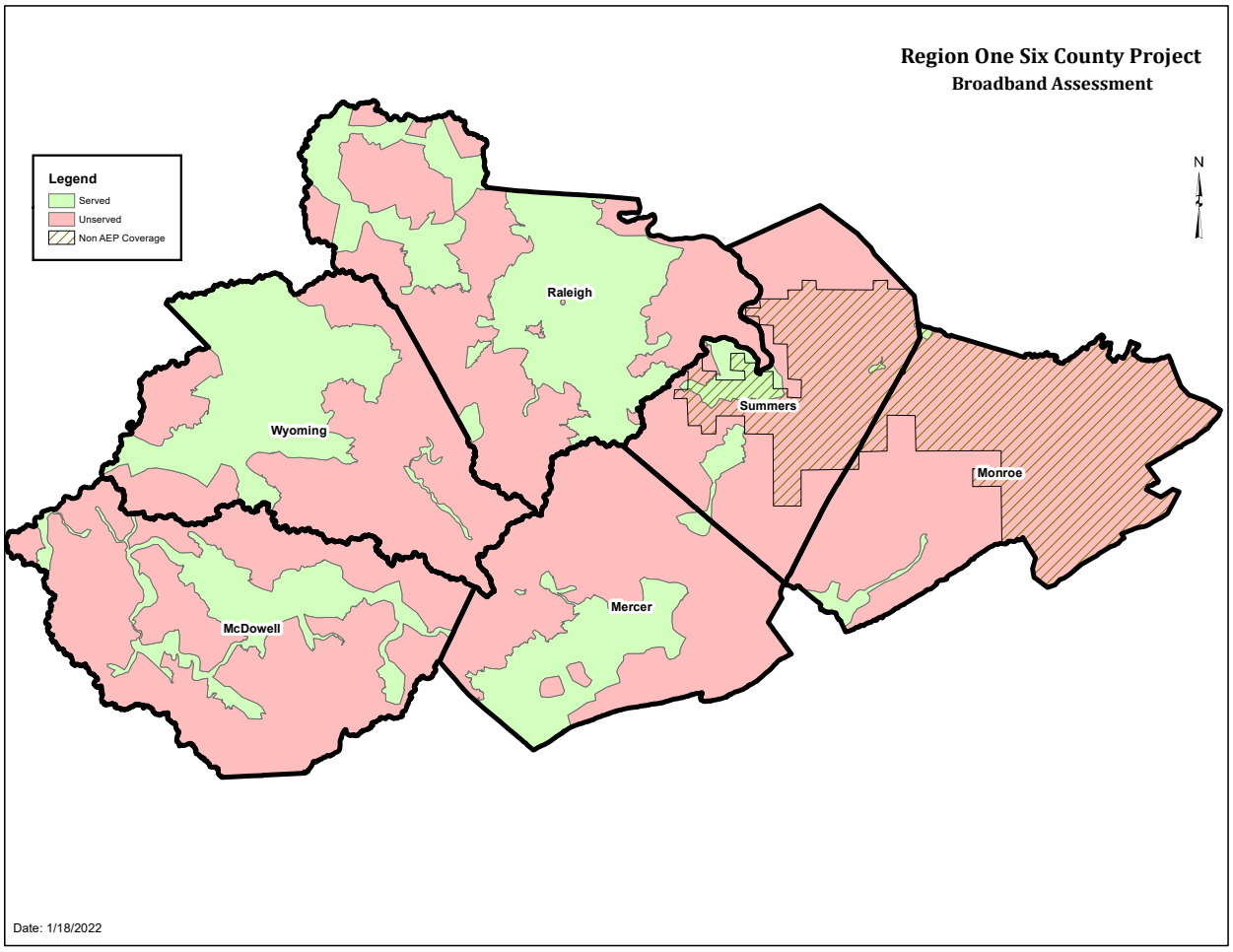
Certain counties, such as Summers and McDowell, had slightly lower response rates. We believe this was due to survey fatigue (COVID 19 surveys, Emergency Connectivity Fund surveys, school surveys and other broadband-related surveys such as GoGig in Summers County, as an illustration).

County	Population	Households	Responses	Confidence Interval*	Served	Unserved	Est.No. of Households Unserved
McDowell	17,186	7,604	276	5.7%	57%	43%	3,270
Mercer	58,381	25,056	502	4.3%	74%	26%	6,515
Monroe	13,250	5,687	489	4.2%	23%	77%	4,379
Raleigh	72,774	31,368	662	3.7%	88%	12%	3,764
Summers	12,431	5,782	203	6.7%	33%	67%	3,874
Wyoming	20,047	8,318	360	5.0%	78%	22%	1,830
Total/Average	**194,069**	**83,815**	**2,492**		**59%**	**41%**	**23,631**

*At 95% Confidence Level

4.2 Map of Served and Unserved

The map below illustrates the overall served (in green) and unserved (in red) findings for each county in Region One. The diagonal lines in Summers Co. and Monroe Co. represent areas outside of Appalachian Power's service territory. A large portion, as a percentage of population, as illustrated in the map in red, is unserved (an average of approximately 41% of the region).



5 McDowell County

McDowell is the southernmost county in the state of West Virginia, with Wyoming Co. to the north and Mercer Co. to the east. The population of just over 17,000 has seen a double digit (20%) decline since 2010. Population is widely dispersed throughout the county, but the largest communities include Welch (the county seat), Gary and War.

5.1 Key Findings

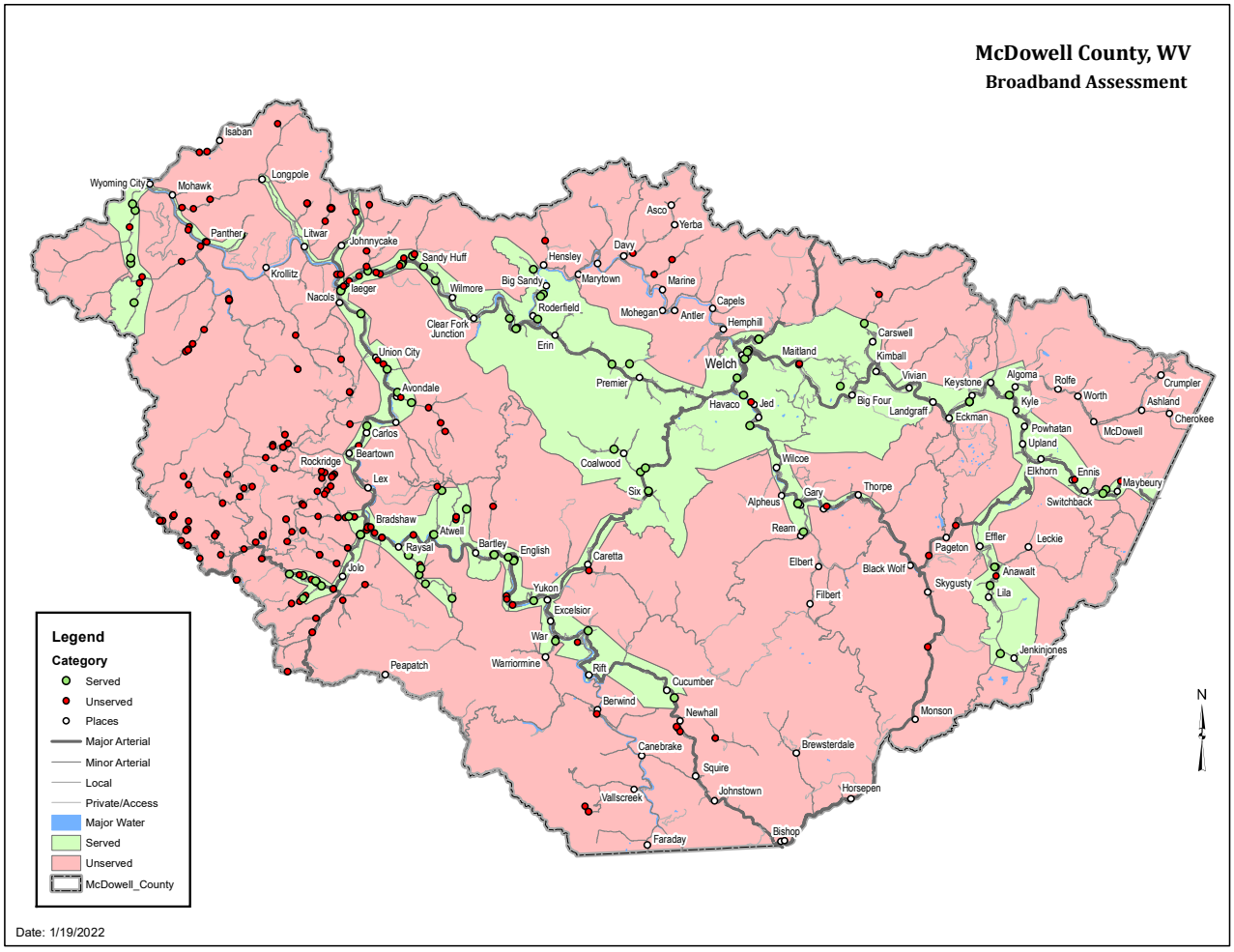
Our study estimates approximately 57% of households are served and about 43% are unserved (or 3,270 households). The terrain in McDowell Co. is extremely mountainous, posing even more of a challenge to service providers and impacting current reliability levels. Wireless service is a key issue in McDowell.

Service providers currently in McDowell County include:

- **A&A Communications** – This small provider has received CDBG funding for the northwestern portion of the county (Panther area) impacting approximately 600 households and is seeking funding to extend its fiber network to more remote rural areas; average customer satisfaction rating was high (on average, 8 out of 10). They offer a less expensive option to Shentel and serve Panther, Mohawk, and surrounding areas.
- **Frontier** – Incumbent local exchange carrier using DSL and with low customer satisfaction rates (on average, 4 out of 10).
- **HughesNet** – Satellite provider with low customer satisfaction rates (on average, 4 out of 10)
- **Otelco** – DSL provider with low customer satisfaction rates. Serves the War and Erwind area.
- **Shentel** – In 2014, Shentel completed a $9 mm, 274-mile fiber network upgrade of old copper lines, as part of the "Reconnecting McDowell" initiative. Shentel offers FTTH Gig services in Welch, Iaeger, Gary, and Northfork, has fiber along the main transportation corridor (Route 52), and serves fiber to the school system. Shentel is well regarded, but its data caps are affecting affordability, as more and more customers have increasing bandwidth needs with decent satisfaction rates (on average, 7 out of 10). Where it offers the FTTH Gig service, the monthly recurring charge for 50 Meg package is $60.
- **Viasat** – Satellite provider (on average, 4 out of 10).

While the Shentel investment met many of the broadband needs of the county, there are still many areas outside the main corridors and larger communities that are unserved. The greatest need appears to be in the western third of the county.

5.2 Map of Served and Unserved



6 Mercer County

Mercer County lies on the Virginia state line, surrounded by Summers, Raleigh, Wyoming, and McDowell counties. Mercer has the second largest population within Region One is widely dispersed throughout the county with the largest communities include Princeton (the county seat) and Bluefield.

6.1 Key Findings

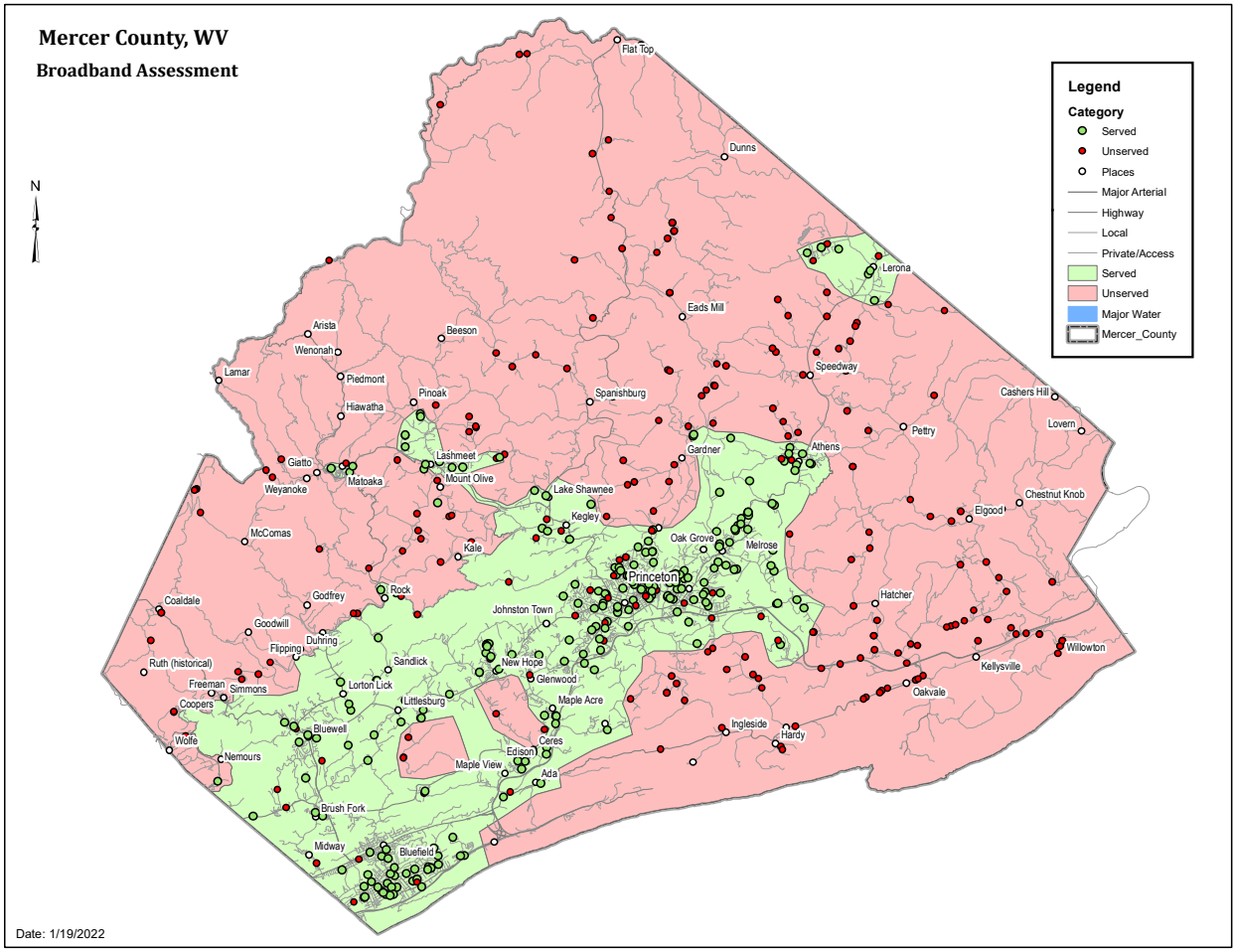
Our study estimates approximately 76% of households are served and about 24% are unserved (6,515 households). The biggest issue for residents in terms of broadband is the lack of availability.

Availability of broadband services is the top issue for residents in Mercer Co, followed by reliability. Three schools in the county have inadequate broadband.

Service providers in Mercer Co. include:

- **Comcast/Xfinity** – Solid option for residents. Serving the Bluefield area and the Green Valley area of Princeton.
- **Frontier** – Negative ratings
- **GigaBeam** - Has a strong presence in Mercer County but households must be in line of sight in order to get quality service
- **Segra** – Serves commercial market only, including the City, and provides bandwidth to GigaBeam. Positive customer satisfaction levels.
- **Suddenlink** – Service has degraded. Providing service in Princeton.

6.2 Map of Served and Unserved



7 Monroe County

7.1 Key Findings

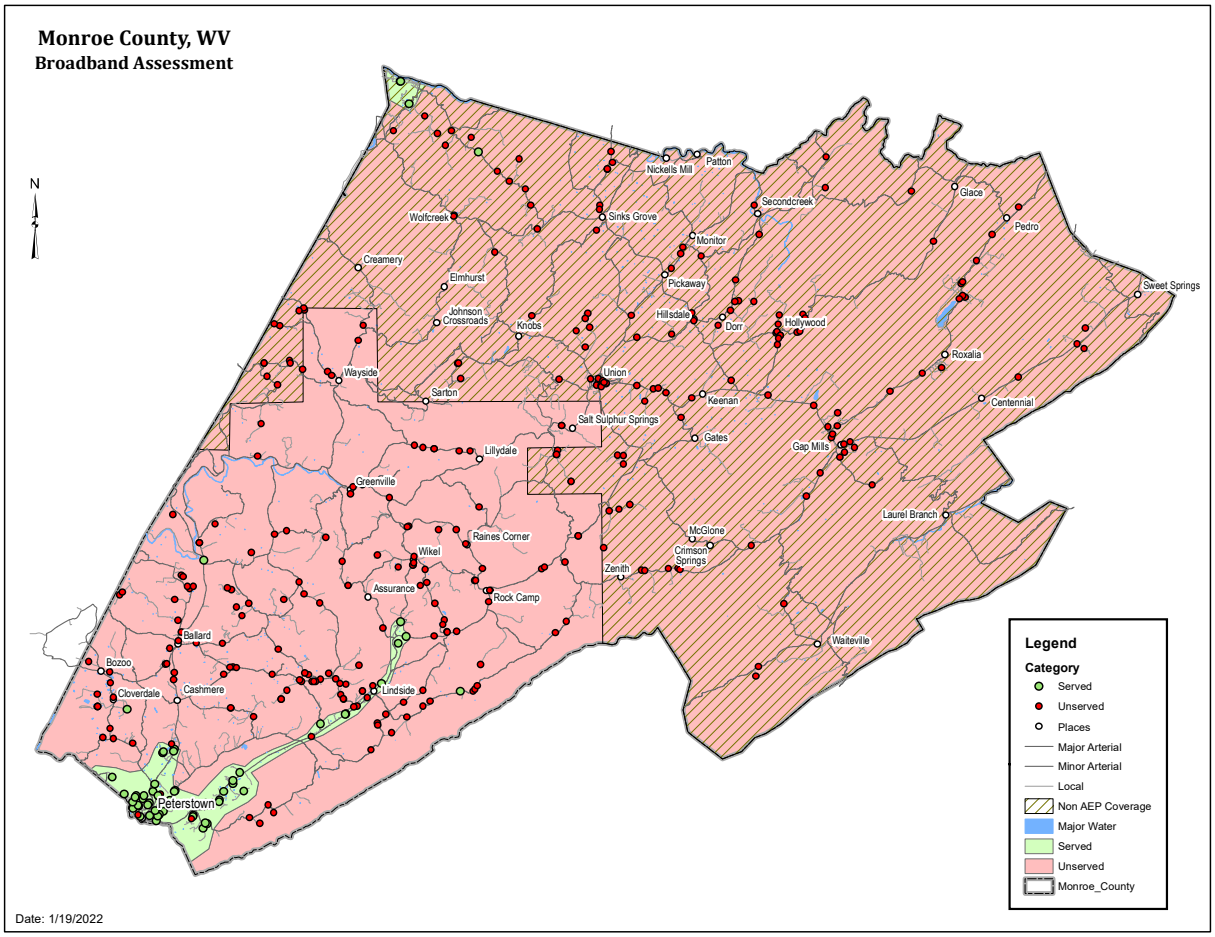
Our study estimates approximately 23% of households are served and an estimated 77% are unserved (or 4,379 households), representing the highest percentage of unserved in Region One. The biggest issue for residents in Monroe Co. in terms of broadband is availability.

Appalachian Power serves about 40% of Monroe County's electric customers. The remaining customers are served by First Energy. The southern end of the county is well served in terms of broadband, including Petersburg and Union. The area of highest economic development opportunity is Peterstown. A new school was being built along Highway 23 (Ballard to Red Sulphur Springs Parkway) with fiber being deployed, but it was unknown if this was a Frontier or Suddenlink build.

Service providers in Monroe County include:

- **Frontier** – Rolling out fiber in parts of the county (considered served) but has not won many contracts. Frontier does have fiber in some areas in Monroe County, which would be considered served. Otherwise, Frontier DSL (which they have deployed in the outlying last mile areas) is considered unserved. DSL speeds are slow, and lines are antiquated and unreliable. Residents complain about pricing, outages, and lack of port availability.
- **GigaBeam** – Potential service rollout with RDOF grant; must be within line of sight of towers to get decent service.
- **WVBA** - GigaBeam's subsidiary.
- **Suddenlink** – Serves various parts of the county, including Peterstown.
- **Verizon** - Wants to set up towers for cellular & internet service. There are no data lines or fiber in between towers.

7.2 Map of Served and Unserved



8 Raleigh County

8.1 Key Findings

Raleigh County is the most populated county studied, with almost 73,000 residents and more than 31,000 households. In generating the highest number of survey response (662), Raleigh County had the highest confidence interval of the entire study area -- (+ or - 3.7%) at a 95% confidence level.

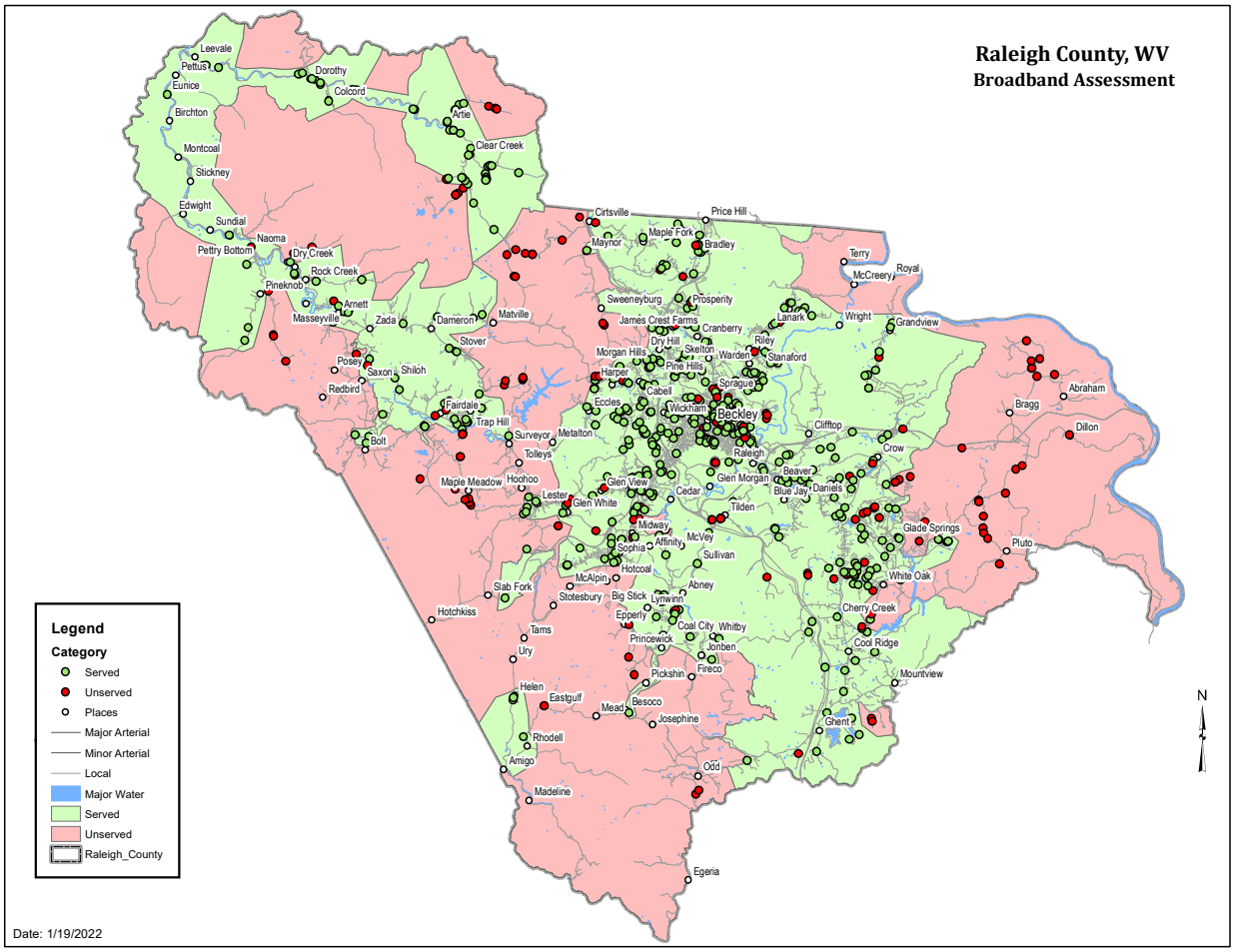
Our study estimates approximately 88% of households are served and an estimated 12% are unserved (or 3,764 households), representing the lowest percentage of unserved in Region One. The biggest broadband issue for residents in Raleigh County is cost and reliability.

Suddenlink is a major provider in Beckley. While the service meets the criteria of "served" residents complain about reliability, cost, and customer service. Recently the WV Public Service Commission has initiated an investigation and public hearings into the service and practices of Suddenlink. http://www.psc.state.wv.us/press/2021/Press_20210701143140.pdf
Many residents in the northwestern corner of Raleigh County use mobile hot spots for Internet access.

Service providers in Raleigh County include:

- **Frontier** – Deploying fiber (FTTH) to the urban core in Beckley and supposedly extending to other parts of the county where populations are sparse**.** Incumbent local exchange carrier (ILEC) also using legacy DSL system with low customer satisfaction rates (on average, 4 out of 10)
- **HughesNet** – Satellite provider with very low customer satisfaction rates (on average, 2 out of 10)
- **Segra –** Appears to have fiber in Sophia. Typically a commercial carrier.
- **Suddenlink –** Cable provider with sufficient speeds but affordability concerns and low satisfaction levels from customers (average 5 out of 10); demand appears to have outpaced capacity. Average reliability is 6 out of 10. Quoted one respondent – "$6k to run a line to a new home in Beckley."
- **Viasat** – Satellite provider with low customer satisfaction (on average, 3 out of 10) and low reliability (2 out of 10)

8.2 Map of Served and Unserved



9 Summers County

9.1 Key Findings

Summers County, with approximately 12,400 residents and almost 5,800 households, is the least populated county in this study area. It generated the lowest number of survey responses (203) and had the lowest confidence interval among the six counties. We believe this was due to survey fatigue.

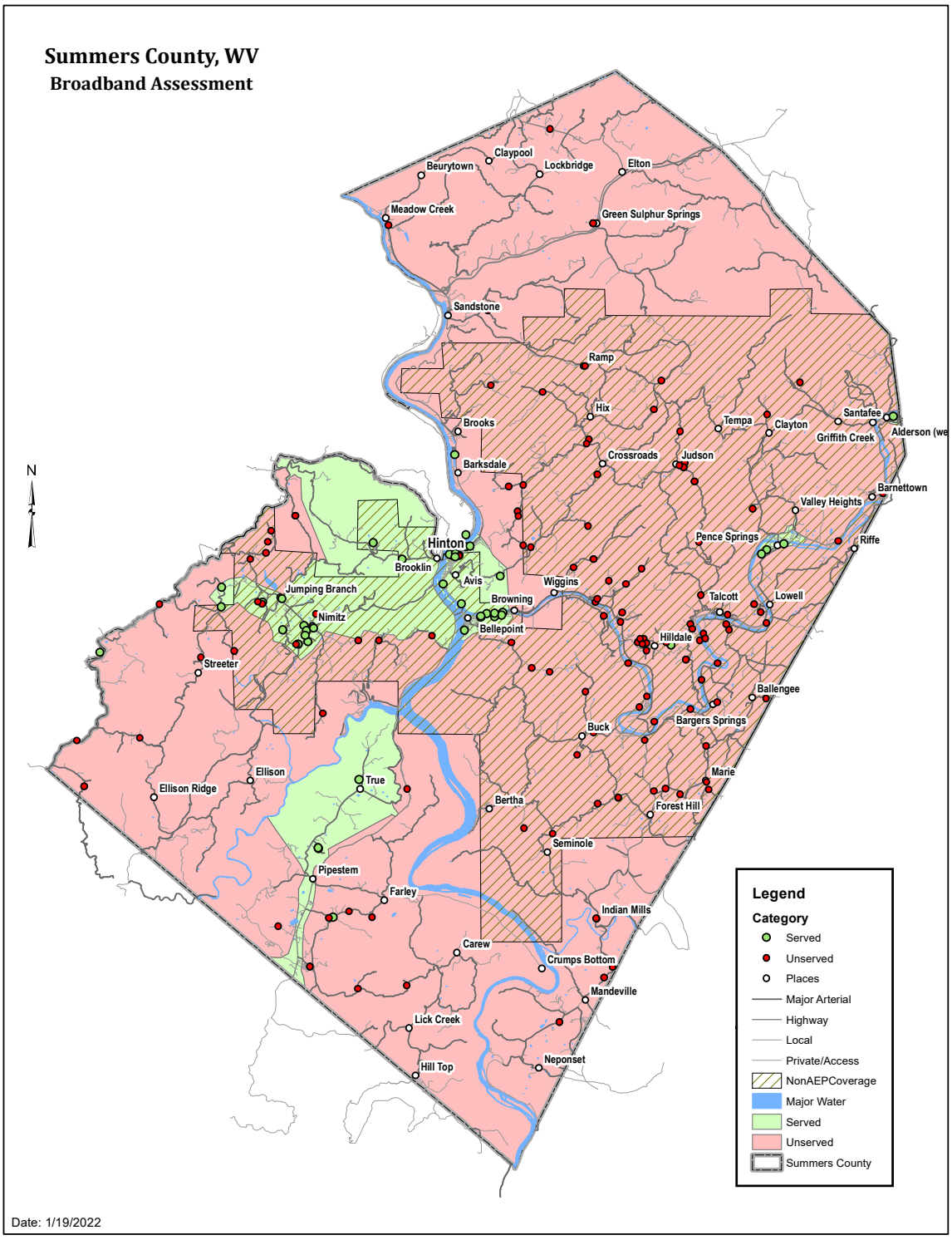
Our study estimates approximately 33% of households are served and an estimated 67% are unserved (or 3,784 households), The biggest issue for residents in Summers Co. in terms of broadband is availability.

Appalachian Power serves only a portion of Summers County's electric needs. First Energy is the other electric utility.

Service providers in Summers County include:

- **Frontier** –Incumbent local exchange carrier (ILEC) also using legacy DSL system with low customer satisfaction rates (on average, 3 out of 10) and low reliability (4 out of 10). During our field verification trip, we observed outside plant crews preparing to deploy fiber cable in the area surrounding Hinton but were unable to determine if it was Frontier contract crews, or another service provider.
- **HughesNet** – Satellite provider with very low customer satisfaction rates (on average, 3 out of 10).
- **Suddenlink –** Cable provider with sufficient speeds but affordability concerns and low satisfaction levels from customers (average 6 out of 10) with affordability concerns. Average reliability is 7 out of 10. Serving Jumping Branch, Pipestem, Hinton, Nimitz, and potentially other areas.
- **Viasat** – Satellite provider with low customer satisfaction (on average, 4 out of 10) and reliability of 5 out of 10.
- **Other –** 32 survey respondents (17%) reported using hot spots on a mobile device for Internet access.

9.2 Map of Served and Unserved



10 Wyoming County

10.1 Key Findings

Wyoming County has a population of approximately 20,000 and more than 8,300 households. We received 360 responses which generated a confidence level right at our target of 5%.

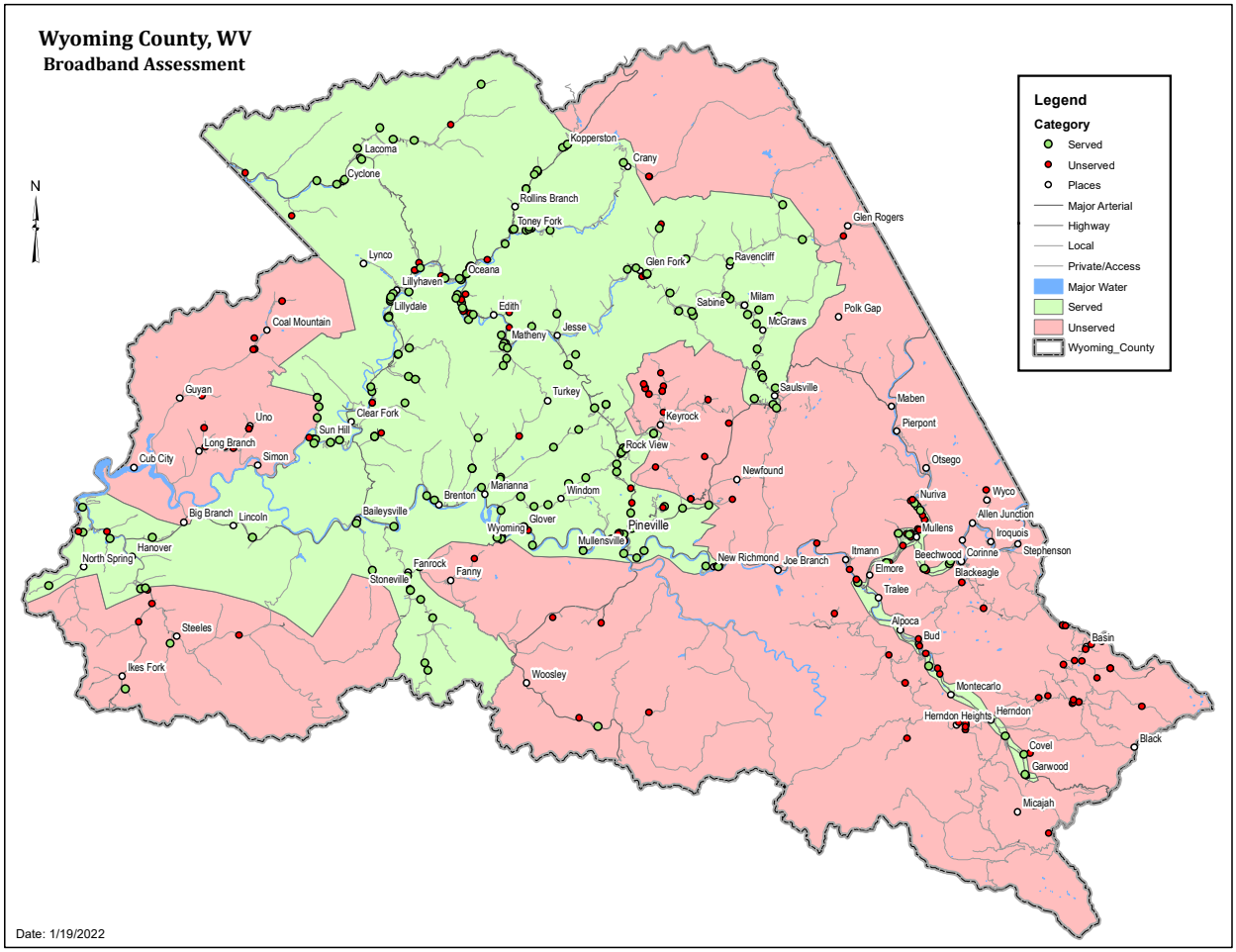
Our study estimates approximately 78% of households are served and an estimated 22% are unserved (or 1,830 households), primarily in the southeastern portion of the county. The key issue for residents in Wyoming Co. in terms of broadband is reliability, followed by affordability (especially in areas of higher poverty). The county has seen network capacity issues recently, especially with the increased network traffic caused by distance learning and remote work due to COVID.

Key issues in terms of economic development were workforce retention/ensuring that people remain in Wyoming County. The county is seeing property values increase and opportunities in metallurgical coal but cannot hire enough miners to meet the demand. Wyoming Co. was recently remapped for 911 purposes and has a strong educational system. Wyoming Co. also presents opportunity as the site of the Hatfield McCoy trailhead. Leaders cited a doubling of trail passes recently and numerous opportunities for recreational tourism growth.

Service providers in Wyoming County include:

- **Frontier** – Has expanded in some areas as Frontier Fiber but primarily still DSL.
- **HughesNet** – Satellite provider with very low customer satisfaction rates (on average, 3 out of 10).
- **Shentel –** Has fiber in the county and serves a good portion. Respondents reported customer satisfaction levels of 6 out of 10 and reliability levels of 7 out of 10 (on average).
- **Viasat** – Satellite provider with low customer satisfaction levels.

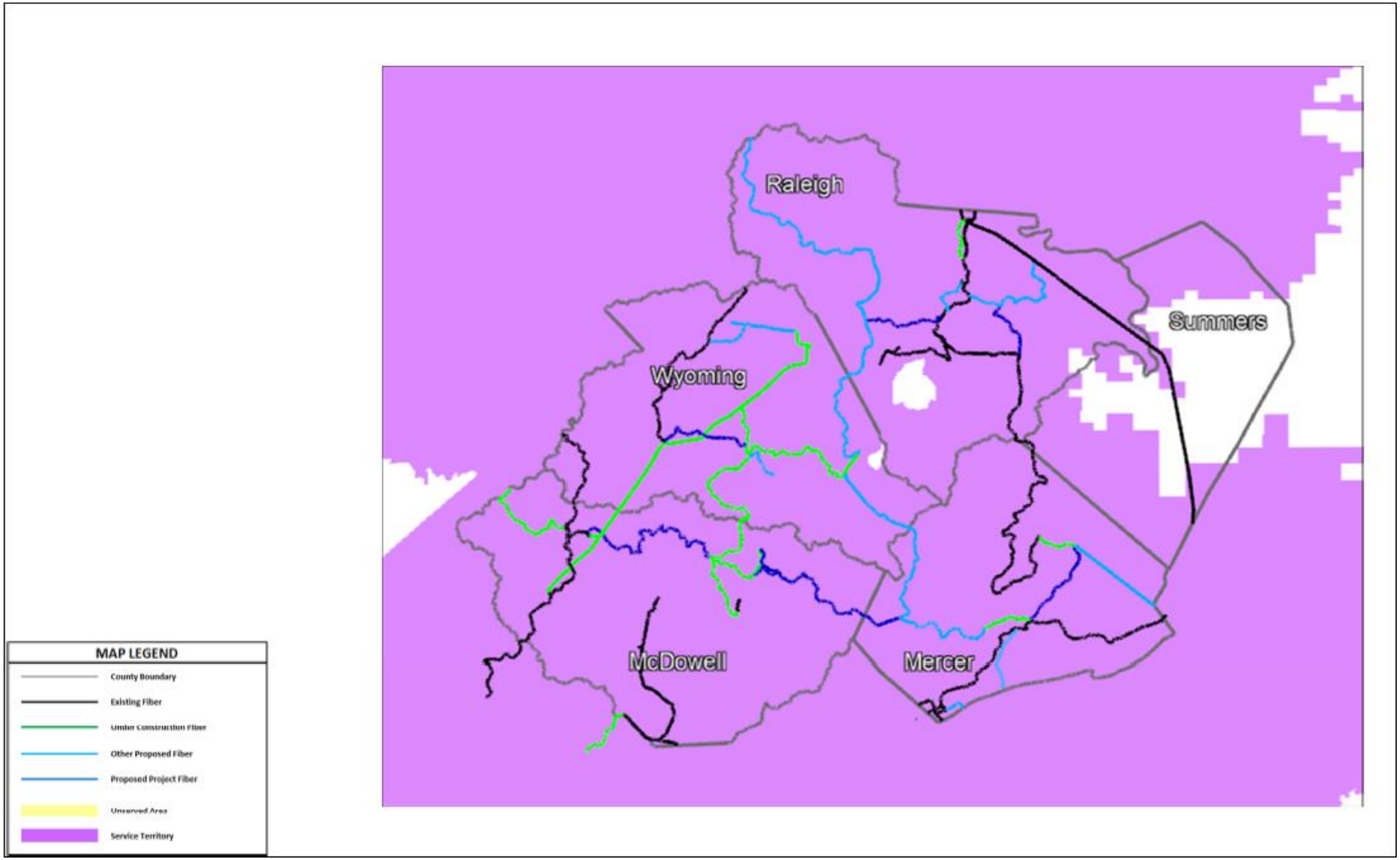
10.2 Map of Served and Unserved

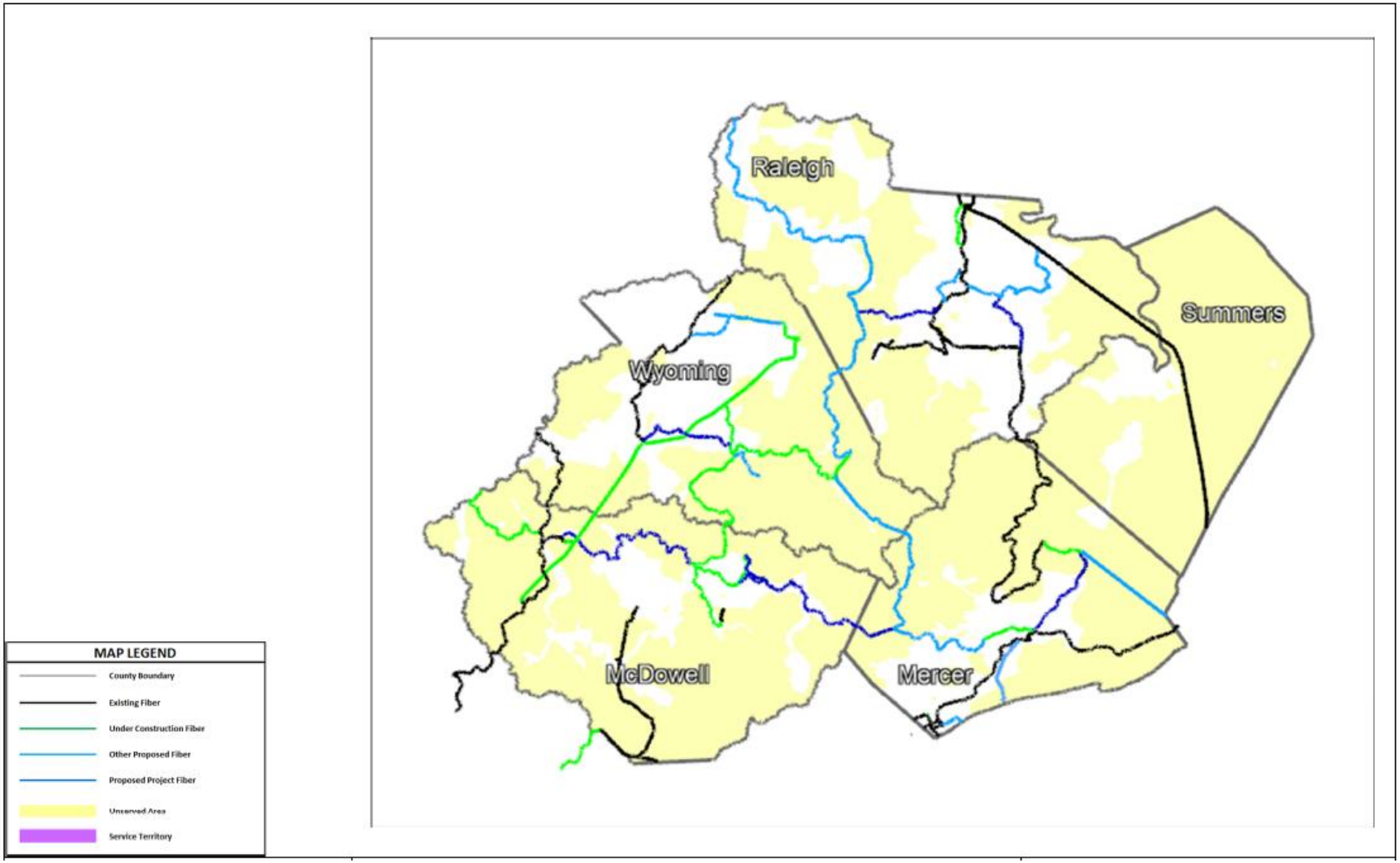


11 Attachments

11.1 Project Files

Project files will accompany this report.


Raleigh
Summers
Wyoming
McDowell
Mercer
MAP LEGEND
County Boundary
Existing Fiber
Under Construction Fiber
Other Proposed Fiber
Proposed Project Fiber
Unserved Area
Service Territory


Raleigh
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Wyoming
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Mercer
MAP LEGEND
County Boundary
Existing Fiber
Under Construction Fiber
Other Proposed Fiber
Proposed Project Fiber
Unserved Area
Service Territory

Exhibit 4

Annual Revenue Requirement
And Residential Bill Impact
$ in millions

Revenue Requirement	
Capital (24 year life)	104.54
Capital (33 year live)	9.08
Accumulated Depreciation	(4.63)
Rate Base	108.98
Return and Income Tax (Pre-Tax WACC)	9.47
Depreciation	4.63
Annual O&M	3.40
Property Tax	2.76
Revenue Requirement	20.26

Depreciation Expense	
Capital (24 year life)	4.36
Capital (33 year live)	0.28
Depreciation Expense	4.63

Annual Revenue Requirement	20,263,328	
Billing Determinants	5,141,200,547	
	Monthly Cost	**Annual Cost**
Residential 1000 kWh customer	$ 2.64	$ 31.69