Broadband Feasibility Study
Jefferson County, Ohio
Completed by Citynet
for
Brooke Hancock Jefferson
Metropolitan Planning Commission

November 11, 2021

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Mr. Michael J. Paprocki
Executive Director
Brooke Hancock Jefferson
Metropolitan Planning Commission
124 North 4th Street
Steubenville, OH

Dear Mr. Paprocki:

Citynet is pleased to present to you the attached Broadband Feasibility Study, which contains the following information:

- A design of a middle mile network that will bring connectivity to Jefferson County.
- The identification and total count of each household located in Jefferson County including a breakdown of the number of households located in each of the provisionally awarded Rural Digital Opportunity Fund (RDOF) census blocks by awardee.
- Proposed fiber routes that need to be constructed to enable gigabit broadband service to each of the end users.
- A review of the eligible and ineligible funding areas located in Jefferson County.
- Estimated costs associated with the Design, Construction and provisioning of the Middle Mile and Last Mile Fiber Routes, including a 10 year cash flow pro forma.

We hope that the information contained herein will be helpful in identifying a long term strategy in improving broadband in Jefferson County, Ohio. Citynet looks forward to continuing to work with BHJ on addressing the broadband needs of the residents and businesses located in Brooke, Hancock, and Jefferson counties.

Sincerely,

Christopher Morris
Senior Vice President

Table of Contents

Electronic Attachments Included

- KMZ File that includes all fiber routes to be constructed in Jefferson County
- KMZ File that includes E911 Addresses throughout Jefferson County
- KMZ File that includes the Map of Provisional Awarded RDOF Areas in Jefferson County
- Award document map for easy viewing for provisionally awarded RDOF areas

Introduction

From the way that we educate our kids to the manner that we deliver healthcare to our citizens, the need for broadband touches almost every facet of our lives. Unfortunately for those living and working in rural America, a digital divide has occurred resulting in access to satisfactory broadband service available in the more urban areas while in more rural areas, providers have struggled to provide even a low level of broadband service. The primary reason that this has occurred is that, predictably and logically, Internet Service Providers (ISP's) have invested into building network infrastructure in more populated areas where they can earn a decent return on their investment. Meanwhile, the people and businesses located in rural areas have been neglected by a one-provider system that functions largely as an unregulated monopoly, or has no service whatsoever. The end result is that the people and businesses located in rural areas often have no choice, but to pay the only provider in town hoping that they receive service, but with no recourse when that provider fails them.

Over the past several years, federal policymakers have recognized this challenge and have been attempting to incentivize investment by ISP's into rural areas by providing subsidies and grants to providers who build network into these currently unserved areas. The most recent and, by far, the largest federal program is the RDOF reverse auction program administered by the Federal Communications Commission (FCC). According to the FCC website,

> "On August 1, 2019, the Commission adopted a Notice of Proposed Rulemaking (NPRM) proposing to establish the $20.4 billion Rural Digital Opportunity Fund to bring high speed fixed broadband service to rural homes and small businesses that lack it. On January 30, 2020, the Commission adopted the Rural Digital Opportunity Fund Report and Order, which establishes the framework for the Rural Digital Opportunity Fund, building on the success of the CAF Phase II auction by using reverse auctions in two phases. The Phase I auction, which began on October 29, 2020, and ended on November 25, 2020, awarded support to bring broadband to over five million homes and businesses in census blocks that were entirely unserved by voice and broadband with download speeds of at least 25 Mbps. Phase II will cover locations in census blocks that are partially served, as well as locations not funded in Phase I. The Rural Digital Opportunity Fund will ensure that networks stand the test of time by prioritizing higher network speeds and lower latency, so that those benefitting from these networks will be able to use tomorrow's Internet applications as well as today's."

There were three providers that were provisionally awarded RDOF Census Block Groups through the Rural Digital Opportunity Fund in Jefferson County. The FCC is continuing their due diligence regarding the technical and financial capabilities of each the following companies in Jefferson County:

COMPANY	Provisional Award Amount in Jefferson County
• Connect Everyone, LLC	$3,453,226.30
• LTD Broadband	$546,228.00
• Mercury Wireless	$405,248.90
Total	$4,404,703.20

As previously mentioned, at the time this report was written, none of the aforementioned companies had received final approval for any of the Census Block Groups located in Jefferson County. Final decisions by the FCC on these provisional awards are expected over the next 30 to 60 days. At that time local leaders will have a better idea of what areas within the County they should focus their efforts and resources.

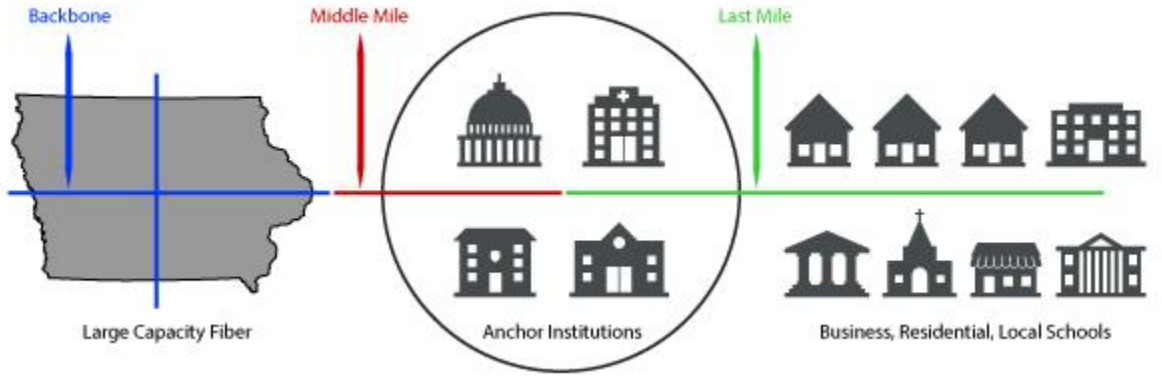
There has a major shift in policy over the past five years. Historically, the federal government had solely provided subsidies to the incumbent telephone companies (ILEC). In many cases, despite the infusion of billions of public dollars, there were little positive results in the improvement of rural broadband service. The last couple of programs, both the Connect America Fund II in 2018 and the current RDOF program have begun providing subsidies and grant funds to competitive providers and cable operators. Unlike the funding traditionally provided to the ILEC's where there was little or no accountability, these new programs include clawbacks and penalties for companies that accept these funds and do not deliver that was guaranteed by the provider. As a result of these major changes, these programs will be much more likely to achieve their goal of improving service in these areas. In the next few years communities throughout rural America will begin to see the advantages of access to true broadband service on par with the service that is available with the more populated areas of the nation. With the closing of the "Digital Divide", the viability of these communities will be forever changed in a positive manner in so many ways including:

- New Economic Development Opportunities: With access to a true broadband connection, local businesses can connect to millions of consumers in just a few clicks of a button.
- Improved Educational Opportunities: Access to true high speed Internet allows children and adults of all ages to access online programs from elementary school up to college and graduate degrees, as well as continuing education opportunities.
- Access to Healthcare: Rural hospitals and clinics can securely connect to larger medical centers with specialists and more advanced equipment resulting in the availability of better health care service to those living in more rural areas.
- Increased Job Growth Opportunities: Companies looking to grow and expand into new areas give great consideration into existing infrastructure of the communities being considered, including broadband service.

Middle Mile Network

There are three basic components that allow the Internet to function. The first component is the Internet backbone. The core Internet backbone generally runs between and connects the major cities throughout the country. The first challenge that must be addressed in delivering quality broadband service in West Virginia is that the core Internet backbone is generally not accessible in rural America. Therefore, providers must find a way to connect a community to the Internet backbone. This is achieved by investing in a middle mile network, which extends the Internet backbone to the community. Middle mile network is defined as "the segment of a telecommunications network linking a network operator's core network to the local network plant." In this instance, Citynet has evaluated the most cost effective way to connect the communities throughout Jefferson County to the Internet backbone, which will be discussed later in this report. The last mile network is defined as infrastructure used to connect ISP's middle mile network to the individual customer. The diagram below illustrates each of these three components of broadband infrastructure.

Diagram 1. Internet Backbone, Middle Mile, and Last Mile

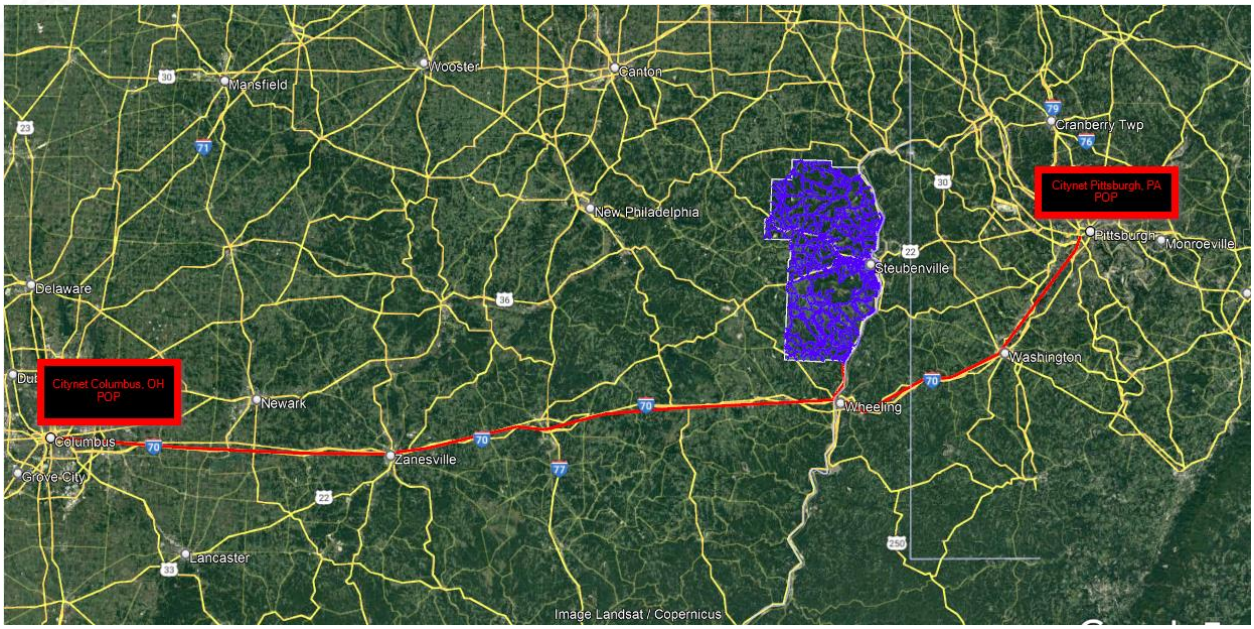


As discussed above, the first step for Citynet or another provider must make in providing broadband service to the residents and businesses in Jefferson County is to extend connectivity from the Internet backbone into your communities. Based on the proximity of this county to access points along the Internet backbone, we have determined that the most cost effective method to bring connectivity to these counties is by connecting to access points in Columbus and Pittsburgh. It is critical that there are two connections extending from the backbone into the desired service area because this provides redundancy to the end users allowing the provider to reroute traffic in and out of these communities in the event there is damage to one of the routes, which would prevent an outage to those customers.

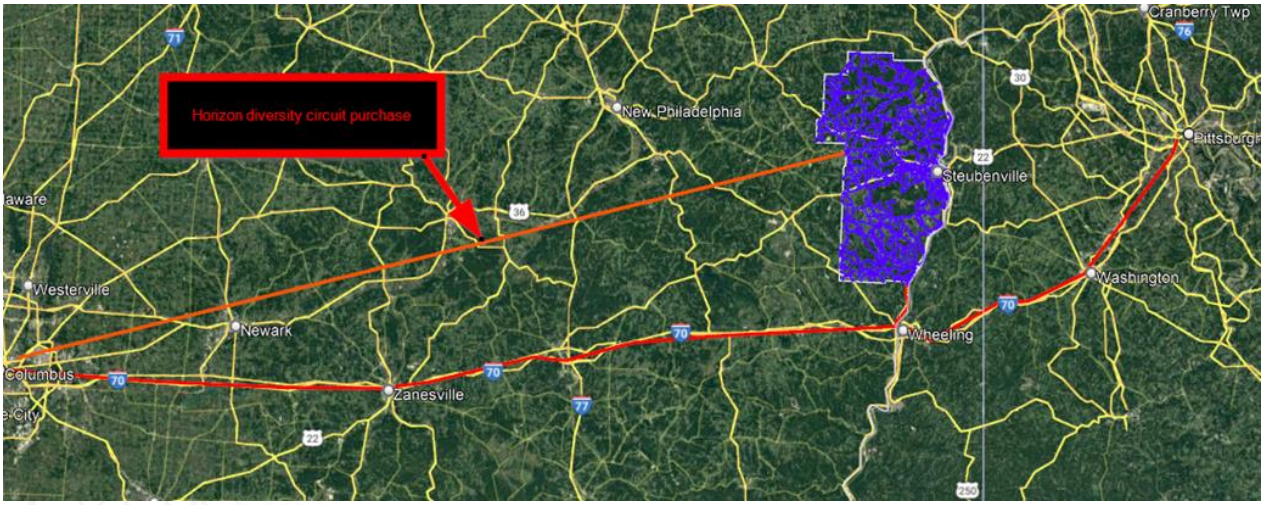
As illustrated in the maps below, the Middle Mile network included in this study contemplates using a middle mile fiber that connects the southern point of Jefferson County to POP's in Columbus and Pittsburgh via fiber running south to Wheeling. This would allow Citynet to connect from Wheeling back to the core Internet backbone in Pittsburgh, Pennsylvania. Citynet uses diverse circuits from the

Wheeling node to connect to the POPs in Columbus and Pittsburgh for Tier 1 Internet connectivity. The challenge presented with this design is that the county is single-threaded from Wheeling to Jefferson County. It would be highly recommended to seek an additional middle mile solution using Horizon fiber, or another provider a similar route from another provider (see Middle Mile Map 2.) Cost for this recommendation was included in the pro forma found later in this report.

Citynet Middle Mile Network Summary (Middle Mile Map 1)



Horizon Diversity Circuit (Middle Mile Map 2)



Location of End Users and Fiber Routes

As part of this study, Citynet was contracted to identify routes that will connect each of the pinned locations identified on the map, and connect these last mile fiber routes to the middle mile network. As previously discussed, this analysis was being conducted just prior to the beginning of a major federal broadband subsidy program being overseen by the Federal Communications Commission. The Rural Digital Opportunity Fund program allows providers to participate in a reverse auction that allows each participant to bid for funding in defined eligible services across the country. The analysis regarding the location of end users and fiber routes will be broken down below by whether or not the locations are included in eligible service areas for this program and, if so, by the provisionally awarded provider.

Jefferson County Data

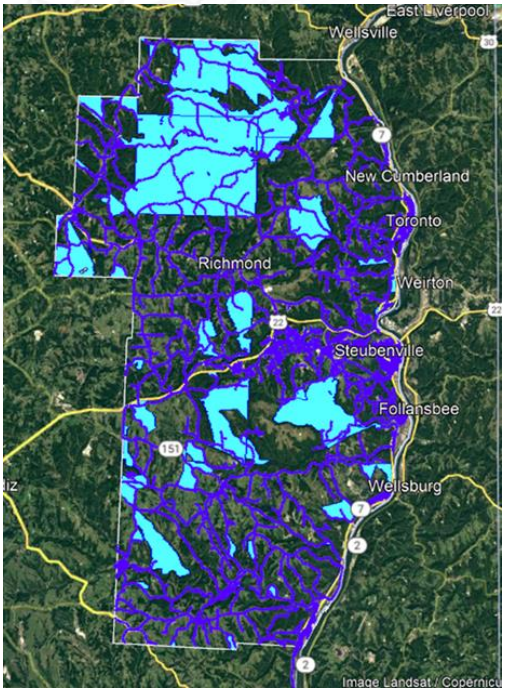
RDOF Areas

Based on the data generated by the State of Ohio, there are a total of 33,971 viable 911 addresses located in Jefferson County. Of these locations, the vast majority, 29,627 of the homes are located outside of the provisionally awarded RDOF census block groups with 2,172 structures located within the RDOF areas and the amount of fiber miles that would need to be constructed to provide service to each home in these blocks broken down by company.

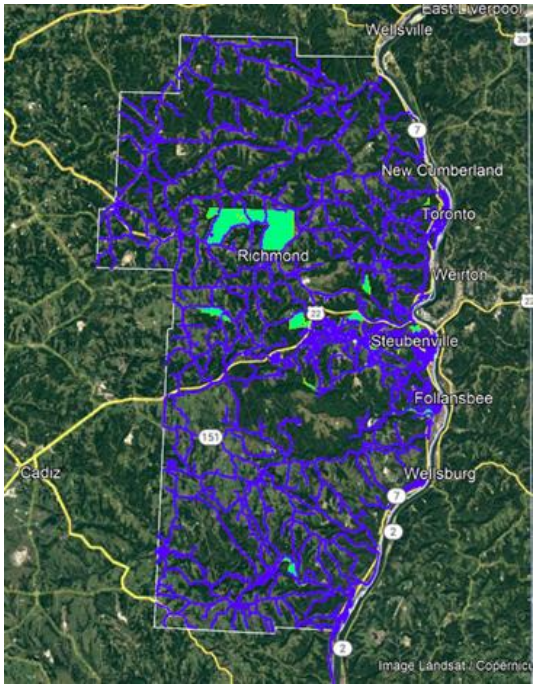
Company	# of Households	Fiber Miles
ConnectEveryone	1,417	141 miles
LTD Broadband	258	17 miles
Mercury Wireless	497	32 miles

Total Households in RDOF areas	2,172 Households
Total Miles of Fiber Miles in RDOF areas	190 Miles

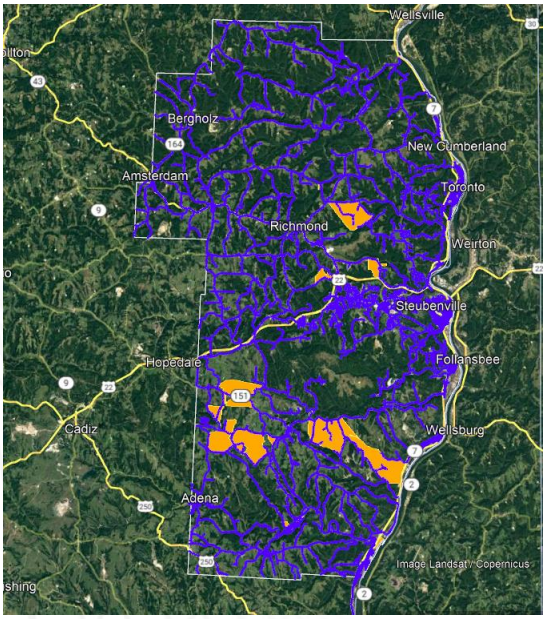
Connect Everyone RDOF Awarded Areas
(in light blue)



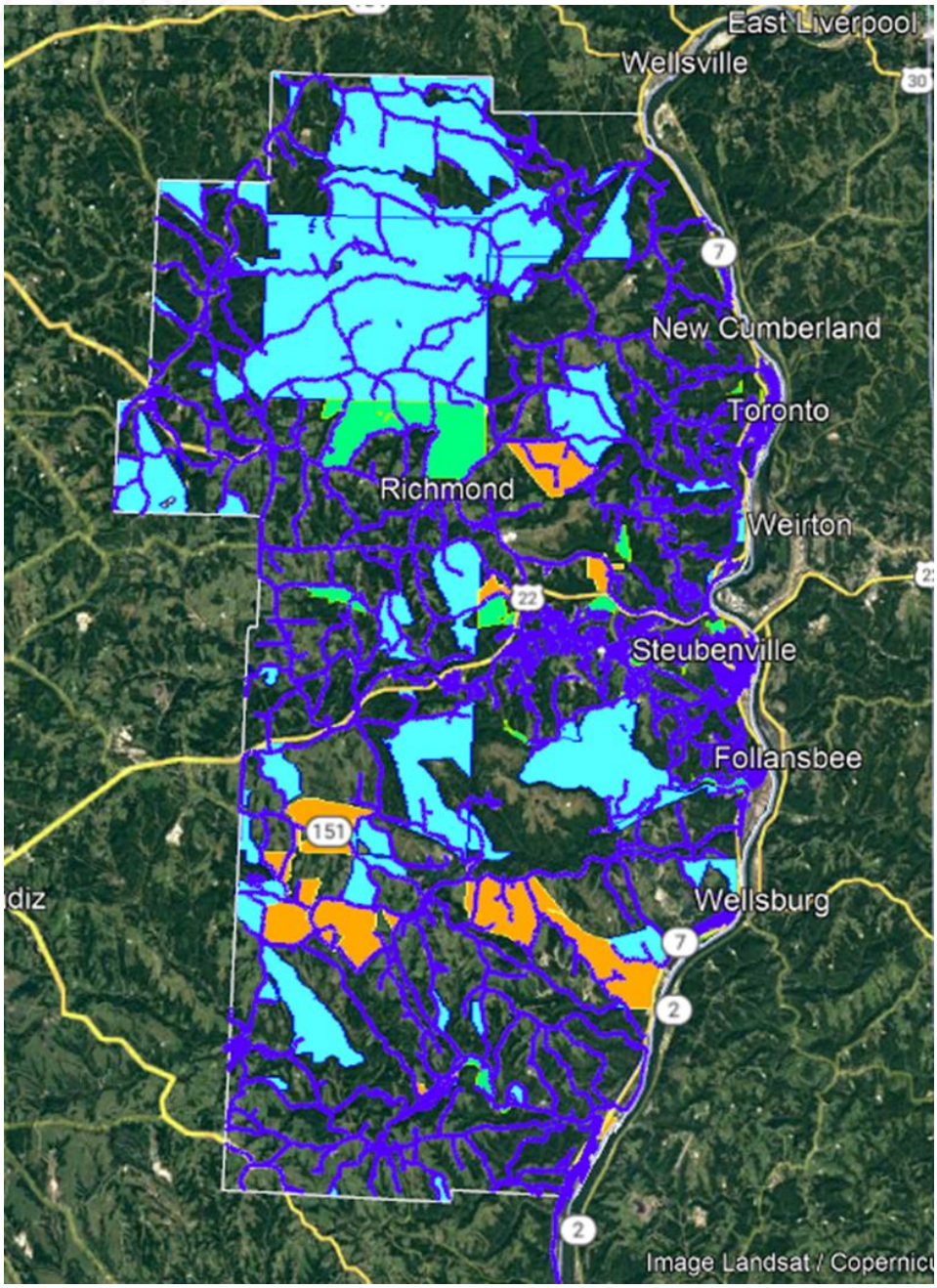
LTD RDOF Awarded Areas
(green)



Mercury Wireless RDOF Areas
(Orange



Map of Jefferson County
(with all three provisional Awardees)



Key: Connect Everyone (Light Blue)
LTD (Green)
Mercury Wireless (Orange)

Jefferson County Data

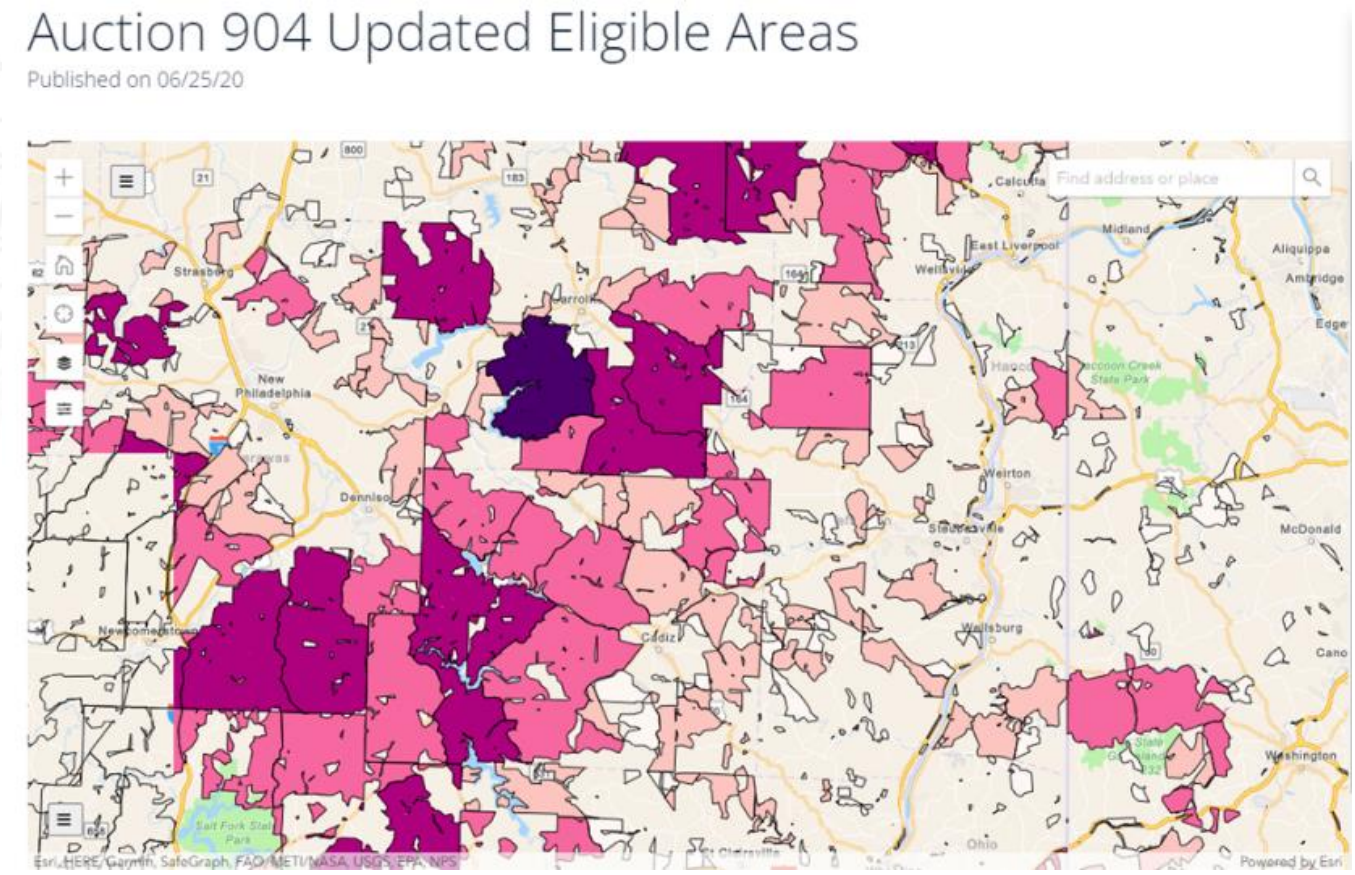
Non-RDOF Areas

There are 29,627 911 addresses in the non-awarded RDOF areas in Jefferson County, Ohio. Through our analysis of these homes, it would require approximately 747 miles of newly constructed fiber to complete a fiber to the premise to enable the delivery of gigabit broadband service to each of the homes. This data supports the concept that the census blocks located within the RDOF eligible areas have substantially fewer homes per mile than the census blocks located outside of these eligible areas further demonstrating why subsidies are necessary to attract providers to the rural areas.

As mentioned earlier, once each of the addresses was uploaded into the kmz file, Citynet drew middle mile and last mile fiber routes that would be necessary to provide service to every address in Jefferson County. By doing so, we can determine an estimated total number of fiber miles needed to provider a Fiber to the Premise (FTTP) solution to allow the provision of gigabit broadband service to each address. Because of the density of the population, when inserting the map of the households into this document, it appears as a large yellow area that is not discernable. As agreed to, this data will be included electronically with all other maps and data included in this study. The map of households in the county, and all other maps and data, are being provided electronically.

The map below is a screenshot from the FCC's RDOF map (https://www.fcc.gov/reports-research/maps/auction-904-updated-jun20-eligible-areas/) indicating the areas located within Jefferson County that are currently considered unserved by the Federal government meaning that no household located within the census block has service of at least 25 Mbps download speed and 3 Mbps upload speed. As you can see, not all eligible areas were provisionally awarded. Based on the current rules, the areas that were not awarded, as well as any areas provisionally won by the three aforementioned companies that do not receive final approval, will be eligible for numerous upcoming funding opportunities including RDOFII and American Rescue Plan (ARP) monies. Based on this information, the shaded areas located within the county are the households that local leaders should first focus their efforts in improving service. From Citynet's perspective, once providers have begun to invest and address the lack of service in these areas, they will naturally look to move into the surrounding areas that have more of a business opportunity due to the population density in those areas.

Unserved areas in Jefferson County



Estimated Costs of Design, Construction, and Provisioning of the Network

Citynet was tasked with determining the cost to construct and provision a Fiber to the Home network reaching every household in the County regardless of whether or not the end user is located in a served or unserved area. The information contained over the next several pages assumes construction to every household in the county regardless of eligibility for federal funding, or whether or not they are located in served or unserved areas.

Jefferson County Ohio Feasibility Study
Assumptions & Summary

•	Customer Take Rate	30%	50%
•	Total Projected Annual Customer Revenue, Maximum Take Rate Achieved	$9,171,900	$15,287,400
•	Average Revenue Per Customer, Internet Only	$75	$75
•	Route Miles	937	937
•	Build Cost, Per Mile	$35,000	$35,000
•	Total Build Cost	$32,795,000	$32,795,000
•	Service Area Total Customer Potential	33,971	33,971
•	Assumed Citynet Customers	10,191	16,986
•	Acquisition Cost Per Customer	$1,000	$1,000
•	Total Customer Acquisition Costs	$10,191,000	$16,986,000
•	POPs	12	12
•	Cost Per POP	$250,000	$250,000
•	Total Cost for POPs	$3,000,000	$3,000,000
•	Total Project Costs	$45,986,000	$52,781,000

Jefferson County Ohio Feasibility Study (30 percent Take Rate)

Take Rate - 30%	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Total
Total Customers Served	**0**	**420**	**1,260**	**2,520**	**4,200**	**6,300**	**8,820**	**10,191**	**10,191**	**10,191**	**10,191**
Cash Inflows											
Customer Revenue, Net	0	204,750	787,500	1,748,250	3,087,000	4,803,750	6,898,500	8,933,400	9,171,900	9,171,900	44,806,950
Total Cash Inflows	0	204,750	787,500	1,748,250	3,087,000	4,803,750	6,898,500	8,933,400	9,171,900	9,171,900	44,806,950
Cash Outflows											
Engineering Costs	586,560	586,560	586,560	586,560	516,295	0	0	0	0	0	2,862,535
Construction Costs	3,833,400	7,666,800	7,666,800	7,666,800	3,098,665	0	0	0	0	0	29,932,465
Network Equipment Costs	1,500,000	1,500,000	0	0	0	0	0	0	0	0	3,000,000
Customer Acquisition Costs	0	420,000	840,000	1,260,000	1,680,000	2,100,000	2,520,000	1,371,000	0	0	10,191,000
Operating Expenses	150,000	199,987	323,385	515,041	791,450	1,169,110	1,649,236	2,144,924	2,269,447	2,345,418	11,557,998
Total Uses of Cash	6,069,960	10,373,347	9,416,745	10,028,401	6,086,410	3,269,110	4,169,236	3,515,924	2,269,447	2,345,418	57,543,998
Net Cash Flow	(6,069,960)	(10,168,597)	(8,629,245)	(8,280,151)	(2,999,410)	1,534,640	2,729,264	5,417,476	6,902,453	6,826,482	**(12,737,048)**
Cumulative Net Cash Flows	(6,069,960)	(16,238,557)	(24,867,802)	(33,147,953)	(36,147,363)	(34,612,723)	(31,883,459)	(26,465,983)	(19,563,530)	**(12,737,048)**	

Jefferson County Ohio Feasibility Study (50 percent Take Rate)

Take Rate - 50%	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Total
Total Customers Served	**0**	**420**	**1,260**	**2,520**	**4,200**	**6,300**	**8,820**	**11,760**	**15,120**	**16,986**	**16,986**
Cash Inflows											
Customer Revenue, Net	0	204,750	787,500	1,748,250	3,087,000	4,803,750	6,898,500	9,371,250	12,222,000	14,888,700	54,011,700
Total Cash Inflows	0	204,750	787,500	1,748,250	3,087,000	4,803,750	6,898,500	9,371,250	12,222,000	14,888,700	54,011,700
Cash Outflows											
Engineering Costs	586,560	586,560	586,560	586,560	516,295	0	0	0	0	0	2,862,535
Construction Costs	3,833,400	7,666,800	7,666,800	7,666,800	3,098,665	0	0	0	0	0	29,932,465
Network Equipment Costs	1,500,000	1,500,000	0	0	0	0	0	0	0	0	3,000,000
Customer Acquisition Costs	0	420,000	840,000	1,260,000	1,680,000	2,100,000	2,520,000	2,940,000	3,360,000	1,866,000	16,986,000
Operating Expenses	150,000	199,987	323,385	515,041	791,450	1,169,110	1,649,236	2,240,503	2,952,017	3,663,084	13,653,813
Total Uses of Cash	6,069,960	10,373,347	9,416,745	10,028,401	6,086,410	3,269,110	4,169,236	5,180,503	6,312,017	5,529,084	66,434,813
Net Cash Flow	(6,069,960)	(10,168,597)	(8,629,245)	(8,280,151)	(2,999,410)	1,534,640	2,729,264	4,190,747	5,909,983	9,359,616	**(12,423,113)**
Cumulative Net Cash Flows	(6,069,960)	(16,238,557)	(24,867,802)	(33,147,953)	(36,147,363)	(34,612,723)	(31,883,459)	(27,692,712)	(21,782,729)	**(12,423,113)**	

Analysis of Jefferson County Broadband Opportunities

Jefferson County Ohio has both rural, sparsely populated areas as well as a number of areas that have densely populated areas that most broadband providers would be able to cost justify the construction of a fiber network without the need for public money in the form of subsidies or grants. Based on the assumptions listed above, without the infusion of some form of subsidy, it would be extremely unlikely for a provider to invest funds to build fiber to every household in Jefferson County. There are certainly areas where it makes business sense for providers to do so, but in most cases, those areas are already considered served by the federal government meaning that at least one home in the census block has access to broadband service of at least 25/3 Mbps. Again, there may be some rural unserved areas in close proximity to more populated areas that may be attractive to an ISP. It is our understanding that the USDA and possibly the FCC will be changing the programs to allow providers to reach areas that do not have service of at least 100/20 Mbps. This would likely have a dramatic effect on the eligibility maps, which would result in the availability of substantial subsidies in areas that are not currently eligible. This will likely occur in both the ReConnect Round III program, as well as the RDOF Phase II reverse auction. It is our recommendation that BHJ continue to monitor the changes in rules that will result in some of the currently ineligible areas becoming eligible for funds in these program. Another recommendation is that those championing efforts to bring broadband to the currently unserved areas of Jefferson County work creatively with potential ISP's to identify funding sources into the eligible unserved areas, many of which are in close proximity to the densely populated areas where there are some tremendous business opportunities in place.