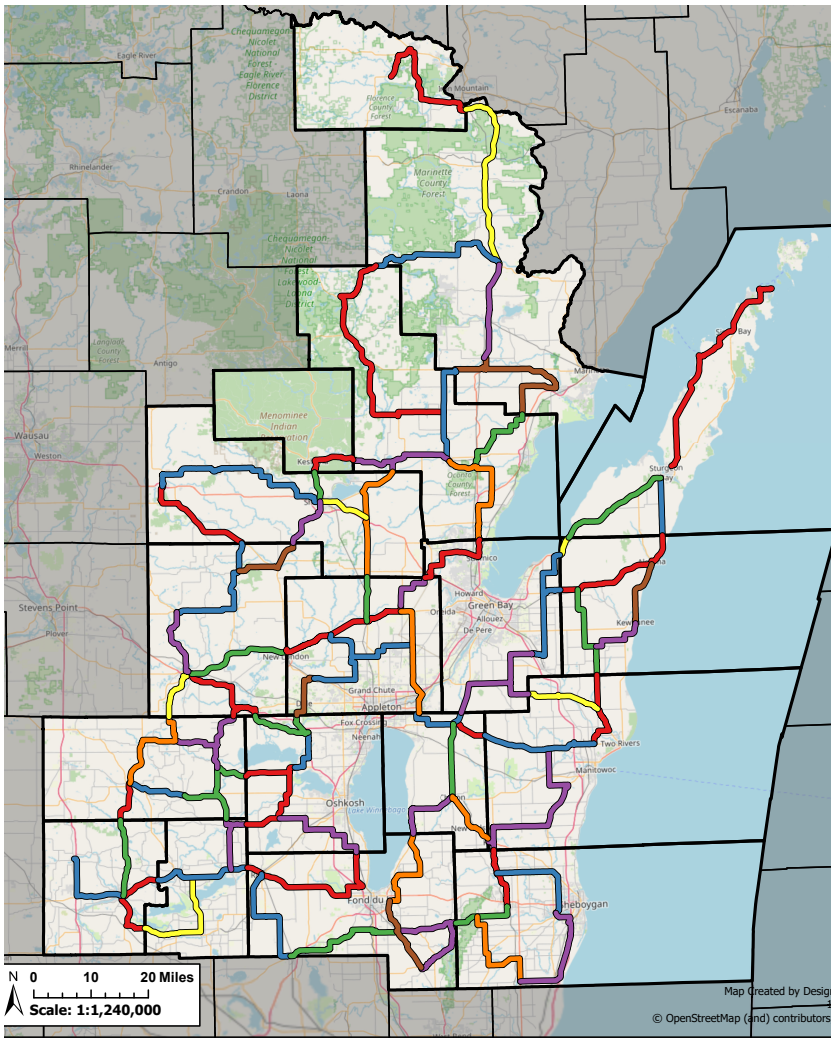
new north®

REGIONAL BROADBAND ACCESS STUDY

New North Region, Wisconsin



DESIGN NINE
broadband planners

MSA

TABLE OF CONTENTS

1 Executive Summary 1

2 Services and Providers Analysis 6

2.1 SUMMARY BY COUNTY 6

2.2 TECHNOLOGY TYPE AVAILABILITY BY ZIP CODE 9

2.3 PRICING SUMMARY BY PROVIDER 14

3 New North Regional Survey Results 17

3.1 DISTRIBUTION OF RESIDENTIAL SURVEY RESPONSES 21

3.2 RESIDENTIAL SURVEY SUMMARY DATA 27

3.3 BUSINESS SURVEY RESULTS 38

3.4 DISTRIBUTION OF BUSINESS SURVEY RESPONSES 39

3.5 BUSINESS SURVEY SUMMARY DATA 45

4 Technology Solutions 69

4.1 OVERVIEW OF THE TECHNOLOGY 69

4.2 DARK FIBER AND LIT FIBER 70

4.3 WIRELESS TECHNOLOGIES 70

4.4 EMERGING WIRELESS TECHNOLOGIES 71

5 New North FiberWay 75

5.1 REGIONAL COLLABORATION 76

5.2 MIDDLE MILE NETWORK ROUTES 80

6 Funding and Financing Options 87

6.1 GRANT APPLICATION ACTIVITIES 88

6.2 WISCONSIN FUNDING OPPORTUNITIES 89

6.3 ARPA (AMERICAN RESCUE PLAN ACT) FUNDING 89

6.4 HUD COMMUNITY DEVELOPMENT BLOCK GRANTS 90

6.5 USDA RECONNECT PROGRAM 90

6.6 RDOF/CAF2 FUNDING 91

6.7 LEASE FEES 91

7 Risks, Legal and Regulatory Considerations 92

7.1 FUNDING 92

7.2 SERVICE PROVIDERS 92

7.3 TECHNOLOGY 92

7.4 LEGAL AND REGULATORY ISSUES 93

8 Network Operations Considerations 94

8.1 ESTIMATED TIMELINES FOR COMPLETION 94
8.4 DARK FIBER LEASE CONSIDERATIONS 95
8.2 GETTING STARTED WITH A REGIONAL STRATEGY 95
8.3 REGIONAL COLLABORATION ROLES AND RESPONSIBILITIES 96
9 Partnership Opportunities 100
Appendix A: Glossary 102
Appendix B: Stakeholder Meeting Attendees 104

Disclaimer
The telecommunications business is continually evolving. We have made our best effort to apply our experience and knowledge to the business and technical information contained herein. We believe the data we have presented at this point in time to be accurate and to be representative of the current state of the telecommunications industry.
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1 EXECUTIVE SUMMARY

A broadband study in the eighteen counties of the New North region began in early fall of 2021 and was completed December of 2021, with consultant report reviews with each county in early 2022. The study included meetings with stakeholders and interested parties throughout the region, interviews and meetings with businesses, meetings with county officials, and residential and business broadband surveys. The work included these key tasks and activities:

- **Asset Assessment and Analysis** – A county by county analysis of demographic data, tower, broadband, and fiber assets in each county, identification of underserved and unserved areas of each county, and broadband technology systems available in each county (e.g. fiber, DSL, cable Internet, wireless, etc.)..
- **Market, Current Use, and Gap Analysis** – A county by county review of current service provider service offerings, speeds, and prices for those services and what bandwidth is available.
- **Broadband Surveys** – A residential broadband survey and a business broadband survey was distributed to every postal address in all eighteen counties. Respondents were invited to fill out the survey online or by completing the survey via a Web form. More than 17,000 responses were received. As part of the survey work, an interactive online speed test was used to collect real time tests of actual upload and download speeds. This online speed test will continue collecting data in 2022.
- **Connectivity Solutions** – This section provides an overview of various technologies, including both broadband wireless and broadband fiber.
- **Regional Middle Mile Strategy** – A regional middle mile strategy is proposed to help accelerate the build out of fiber to the home and fiber to the business, particularly in underserved and unserved areas of the region. The middle mile network can also substantially improve current and future fixed point wireless broadband services.
- **Infrastructure Funding and Grant Opportunities** – A discussion of a variety of grant and funding strategies.
- **Risks, Legal, and Regulatory Considerations** – A review of potential risks in making broadband investments, and legal and regulatory considerations.
- **Network Operations Considerations** - An analysis of tasks and activities associated with working with ISPs and WISPs, and key tasks and activities that would be associated with regional middle mile network.

The survey data collected as part of this study indicates that residents and businesses are anxious for better Internet service. Because a very large number of often passionate comments were received, they have been included in a separate document.

- 50% of respondents are "dissatisfied" or "very dissatisfied" with their current Internet speeds, and 88% of residents are interested in faster and more reliable Internet service.
- 96% believe that New North and/or the local governments should help facilitate better Internet access.
- 35% of residents report the quality of Internet service is affecting where they choose to live.
- 98% of businesses indicated that the Internet is important to the success of their business.
- 71% of businesses reported that they need employees able to work from home.

Future-oriented Infrastructure

Affordable high speed Internet is essential to the future growth and prosperity of the New North region. Over the past twenty years, Internet access has evolved from a luxury to a necessity. School students need Internet access to complete homework and to study. Online shopping can save energy and make it easier for the elderly and homebound to obtain the needs of every day life. Telemedicine and telehealth services and applications is revolutionizing health care, reducing costs, and allowing older citizens to live independently longer.

More and more workers and business people are working from home, either on a part time or a full time basis, and the Covid crisis has highlighted the critical need for reliable high performance Internet service for work, learning, and access to health services. New work from home job opportunities are growing rapidly, but most of those jobs require reliable, symmetric Internet service to qualify.

Many business employees are already trying to work more from home more often (e.g. one or two days per week) to reduce travel costs. Some major businesses in other parts of the U.S. are actively planning to have 20% of their workforce work full time from home to reduce employee travel costs and office energy costs. Corporate employees working from home require high bandwidth services to be connected to the office network and to use corporate videoconferencing systems. These corporate network services often require 10-50 Megabit ***symmetric*** connections.

Broadband has become essential community infrastructure.

Just as communities had to take on the task of building and maintaining roads in the early twentieth century, communities must now help develop and support digital road systems as a matter of community and economic business development.

The New North region, with the right broadband infrastructure, has much to offer to businesses seeking to relocate:

- Great quality of life with a diverse group of small, medium and large communities.
- Tremendous recreational opportunities throughout the region.
- Excellent K12 school systems and a wide range of higher education options.
- Low cost of living and very affordable housing compared to many large metro areas in other parts of the country.
- A well-educated work force with a diverse set of technical and job skills.

With the right broadband infrastructure, the New North region can be attractive not only to businesses seeking to relocate, but also to an emerging group of businesspeople and entrepreneurs that typically are well-educated, own their own businesses or work for large global corporations, and are making choices about where they lived based on family needs and interests, rather than business interests.

This new breed of entrepreneurs and workers place a high value on the kinds of amenities that contribute to a good quality of life–traditional neighborhoods, vibrant downtown areas, a wide range of cultural and recreation opportunities, good schools, and a sense of place. These businesspeople and their families make relocation decisions based on quality of life only where there is abundant and affordable broadband, because broadband is the enabler of this new approach to personal and work life.

It is also important to note the impact of the Covid pandemic. During the lengthy period of business shutdowns and work from home requirements, many businesses and workers realized that living in a large metro area with heavy traffic, lengthy commutes, and a high cost of living was no longer necessary for many professional and white collar workers.

This rise in interest for permanent work from home situations represents a tremendous opportunity for the New North region to attract those workers. However, those seeking permanent relocation for work from home will be making decisions based on the availability of high performance, affordable broadband, and in particular, will place a high value on homes with fiber Internet service.

Recommendations

Develop a regional Broadband Strategy. Use the findings and recommendations in this report to develop a multi-year set of goals that can be realistically achieved using a basket of local, state, and Federal funding. Commit to providing the grant writing resources needed to pursue every possible grant opportunity.

County governments should not become Internet providers. Instead, the local governments should focus on developing public/private partnerships by making targeted investments in passive broadband infrastructure like towers and dark fiber. These assets have long life spans of forty years or more and can be leased out to private sector ISPs (passive infrastructure leasing is not a telecommunications service). While the revenue from the lease agreements will be modest, the funds generated can be used to support maintenance of this infrastructure.

Improved and Affordable Fiber and Wireless is Needed. Many residents and businesses rely heavily on poor DSL Internet access and need an alternative. Improving service provider access to more towers in the rural and underserved areas of the region will support improved Internet service. Expanded fixed point broadband wireless service is a critical strategic short term goal in the the region, but widespread access to wireless and fiber access is critical to the long term economic growth of the New North. In most of the New North counties, fixed point wireless coverage is excellent, with many counties showing nearly universal access to wireless broadband. The counties and the region should reserve some, and perhaps a majority, of ARPA funding to support increased fiber to the home availability, especially in the smaller communities and underserved areas of the New North.

Develop partnerships with WISPs and ISPs. WISPS and ISPs should be provided a copy of this report, and then be invited to meet to provide input on what infrastructure investments would enable them to expand service most efficiently. Local and regional WISPs may be able to provide insight into where towers are most needed and what they are willing to pay for tower space. WISP and ISP suggestions should help inform the broadband strategy for both county-level strategies and the regional strategy, noting that ISP/WISP demands may not always match the long term broadband needs of businesses and residents.

Ordinance and Planning Changes – A variety of strategies can be implemented at the county and regional level that do not require significant capital expenditures but can cumulatively have a positive long term impact.

- Conduit/fiber overlay plan – Identifying where it is desirable to have telecom infrastructure and maintaining that data in county GIS systems is an important first step.

- Map private sector assets – All telecom ROW permits should be carried from town and county Planning and Engineering departments to the GIS department and maintained and updated regularly. It is important to get all "red line" and as-built changes from contractors and telecom firms so that accurate records are kept on telecom infrastructure.
- Integrate telecom into planning and permitting – New construction, road and sidewalk improvements, and other infrastructure projects should include a review of the fiber overlay plan to assess the value of adding, at a minimum, conduit and handholes. Private developers should be encouraged early in the planning process to add conduit and handholes to both commercial and residential projects.
- Open ditch policy – Look for joint trenching opportunities. As noted above, a conduit and fiber overlay plan will help identify where limited capital funds for telecom infrastructure can be put to best use. Occasionally, private sector infrastructure projects will agree to participate in a joint (shared) trench opportunity.
- Minimize tower permitting costs – Tower ordinances that require unusually high cost engineering and radio interference studies can discourage private sector investment. Tower ordinances and permitting fees should find a balance between the need to protect the public and minimizing the cost of erecting new towers.

Seek Grant Funds. The Federal government has been steadily increasing the amount of grant funding available for broadband infrastructure, with USDA and HUD both having programs that are designed to help underserved and unserved areas construct new broadband infrastructure. Some Federal grant applications will be due in mid-spring of 2022, so planning for submitting grant proposals should begin in early January 2022.

Covid relief funding (ARPA, American Rescue Plan Act) should also become available in early 2022. Because ARPA funding is expected to exceed the previous Covid funding program (CARES), County shares of ARPA funds should be substantial and a portion of it could cover a large part of the needed broadband infrastructure improvements.

Some of the grants will allow joint applications from a county and ISPs/WISPs (i.e. public/private partnerships). New North counties should use this report to create opportunities to explore public/private partnerships that will seek funding for specific improvements in underserved areas of the county.

Manage Expectations. The current deficiencies in Internet access in the region took decades to develop, and the proposed improvements should be approached as a multi-year process, with an expectation of substantial improvements in access and availability in nine to fifteen months. More information on the time needed for wireless and fiber broadband improvement projects is included in Section 8.1.

Develop a long term funding strategy. Grants may not provide sufficient funds to reach the the regional and individual county long-term community and economic development goals. Evaluate longer term funding strategies, like using a special assessment, or implementing a very small increase in property taxes. Revenue would be earmarked exclusively for broadband improvements. Improvements in broadband access and affordability in the region will be most successful by recognizing that funding will come from a range of funding sources rather than a

single source. Grants, public/private partnerships, some local funds, and other sources may all be needed to achieve success.

Grants can be extremely important in the early stages of an effort to support planning activities and/or to fund a first-phase build-out initiative. However, grants rarely allow spending on operational expenses. Grants should be used carefully as one-time cash injections to support very specific goals. Communities that have relied too heavily on "the next grant" as a key source of expansion or operational funding usually experience severe financial problems.

Demand and Speed Test Data Aggregation – New North should continue to maintain and support the existing online speed test data Web site and promote the use of it throughout the region. This data will be extremely valuable in support of grant applications where FCC 477 may not represent unserved and underserved areas accurately.

Middle Mile Network – A regional middle mile dark fiber network, developed collaboratively by the New North counties, other local and regional partners, and New North, would significantly accelerate the availability of fiber to the home and fiber to the business in the New North region. It would also be an extremely powerful economic development tool—allowing tech-oriented businesses to locate almost anywhere in the New North region.

The middle mile network should have the following characteristics:

Wholesale Business Model – The New North region, if it moves forward with the initiative, should operate the middle mile network on an open access, wholesale business model with a wide range of competitive providers offering business and residential services. A single public wholesale price list will be used to determine the cost of provider use of the network. The enterprise will not offer any telecommunications services to businesses and residents—it would be operated strictly as a dark fiber network via dark fiber leases and IRUs (Indefeasible Right of Use), in compliance with Wisconsin law.

Business-class Capable - The network should be based on a future proof fiber architecture using a dual Active Ethernet and NG-PON design for high performance residential and business-class services available to every location on the network. The network should be designed to deliver Active Ethernet to businesses and institutions, with any desired quality of service (QoS) required to make New North businesses competitive in the world economy. This approach will provide a fiber infrastructure capable of delivering any current or future service.

Redundancy and Resiliency – The network should be designed with a redundant "ring" architecture to minimize downtime from accidental fiber cuts and network equipment failures. New North businesses, K12 schools, health care facilities, higher education, and home-based workers will have a high reliability network.

Universal access – The goal of the effort should be to facilitate rapid expansion of private sector offerings of high performance fiber and wireless services to all residents and businesses as rapidly as possible consistent with fiscally conservative operations.

2 SERVICES AND PROVIDERS ANALYSIS

2.1 SUMMARY BY COUNTY

The information in the service provider reports starts with downloading a list of zip codes for each county. Zip codes dedicated to post office boxes (no physical address is available) and zip codes with less than five percent of their population in each county are eliminated.

Internet data services are used to provide initial service provider availability. Every service provider examined and included in the has pricing local to the New North Counties except where none could be found. Prices are determined by visiting website and entering addresses or making phone calls to the company about services at specific addresses within a zip code. If automated address verification services are available, those are used. Those services often say they are no working and ask for a phone number to be called. It is likely this is by design.

An example of address verification would N6010 Westhaven Dr, Fond du Lac, WI 54937 which was used to verify the pricing of Marquette Adams Internet services in Fond du Lac County. Sometimes a large number- up to twenty -addresses are tried before a success verification with local pricing is achieved. While we were unable to verify AT&T Fiber pricing in New North, a discussion with an AT&T fiber representative indicated that AT&T Wisconsin fiber pricing is identical to fiber pricing in North Carolina. A verified North Carolina AT&T address was used to get AT&T fiber pricing for the report.

All terms and conditions come from Service Provider websites. Some of the smaller service provider websites have little or no information and they are reluctant to provide information until a customer has signed up.

Brown County

Eight zip codes in Brown County showed some (Between .5% and 7.6%) residential fiber. No zip had fiber availability higher than 8%. Cable services were unavailable in one zip code and limited (45% or less) in four of the County's zip codes. All fifteen zip codes had 100% wireless availability.

Calumet County

Only two zip codes in Calumet County showed some (2.1% and 2.3%) residential fiber. All but one zip code in Calumet County showed over 71% of cable availability. The one zip code, 53042, showed 56% cable availability. All zip codes had 100% wireless availability.

Door County

No zip codes in Door County showed any residential fiber. Cable services were either unavailable or extremely limited in six of the County's ten zip codes. One sip code, 54213, only showed wireless availability Wireless availability was at 100% for nine of the ten zip codes examined.

Florence County

While some fiber is shown by one data source in zip code 54151, 75.6% of that zip codes lies outside of County boundaries. Our research was unable to uncover any Florence County

residential fiber. Florence County had two zip codes, 54120 and 54542, showing no cable availability. Only one zip code in Florence County, 54121 with 63% cable availability, had more than 50% cable availability. All zip codes had 100% wireless availability.

Fond du Lac County

Only one zip code - 54971 - showed 2.5% fiber availability Fond du Lac County had four zip codes, 53931, 54932, 54935 and 54964, showing no cable availability. There were four other zip codes, 53010, 53019, 53079, and 53919, that had cable availability of less than 50%. Eighteen of twenty zip codes had 100% wireless availability.

Green Lake County

Three zip codes - 54923, 54941, and 54971 - showed small amounts of fiber availability between 2.0% and 2.5%. Green Lake County had two zip codes, 53923 and 53926 showing no cable availability. Five of eight zip codes had 100% wireless availability.

Kewaunee County

No zip code in Kewaunee County showed any fiber availability. Also Kewaunee County had three zip codes, 54205, 54213, and 554217 showing no cable availability. Two other zip codes, 54208 and 54216, had less than 50% cable availability. All six zip codes had 100% wireless availability.

Manitowoc County

No zip code in Manitowoc County showed any fiber availability. Also Manitowoc County had eight zip codes showing less than 75% cable availability. One of those zip codes, 53063, had no cable availability. All twelve zip codes had 100% wireless availability.

Marinette County

Only one zip code, Niagara 54151, in Marinette County showed fiber availability. It was not possible verify those fiber services due to the structure of the ISP's website. Also Marinette County had seven zip codes showing no cable availability. Five other zip codes had cable availability of less than 33%. Fourteen of fifteen zip codes had 100% wireless availability. The one other zip code, 54103, had 90% wireless availability.

Marquette County

Four zip codes in Marquette County showed significant fiber availability. Two of those zip codes, 53920 and 53930, had 100% fiber availability. Marquette has the most fiber availability of any of the New North counties that were examined. Marquette County had four zip codes showing no cable availability. Only one of the eight zip codes, 53592, showed less than 99% wireless availability. The one other zip code, 54103, had 90% wireless availability. Five of the eight zip codes had 100% wireless availability.

Menominee County

No zip codes in Menominee County showed any fiber availability. Menominee County had one zip codes showing no cable availability and another with only 26% availability. All three zip codes had 100% wireless availability.

Oconto County

Two zip codes, Pulaski 54162 and Sobieski 54171, in Oconto County showed fiber availability. Also Oconto County had four zip codes showing no cable availability. Two other zip codes had cable availability of less than 10%. All but one of eighteen zip codes had 100% wireless availability.

Outagamie County

No zip code in Outagamie County showed any residential fiber. There were three zip codes in the County that showed no cable availability. There were three other zip codes with under 50% cable availability.. All but two of twenty zip codes had 100% wireless availability. Those two had 98% and 99% wireless availability.

Shawano County

Only two zip codes in Shawano County showed significant residential fiber- 54162 with 3.7% and 54166 with 34% (54499 had 0.2%). In addition Cirrinity (formerly Wittenberg Telecom) is switching out DSL customers and building fiber. Due to the lack of automation on their website, the extent of the fiber could not be verified. There were four zip codes in the County that showed no cable availability. There were ten other zip codes with under 50% cable availability. All nineteen zip codes had 100% wireless availability.

Sheboygan County

No zip codes in Sheboygan County showed any residential fiber. There were two zip codes, 53023 and 53079 with under 50% cable availability. There were ten other zip codes with under 50% cable availability. All sixteen zip codes had 100% wireless availability.

Waupaca County

Four zip codes in Waupaca County showed significant residential fiber. One, 54961, had a minor amount (0.2%) of fiber available. There were two zip codes, 54949 and 54962 with no cable availability. Seven other zip codes had less than 50% cable availability. Fixed wireless coverage is excellent in the county. Gamewood Technology Group showed in one of our data sources, but it could be not be verified. The one reference indicated fixed wireless service to 2.33% of customers in zip code 54981. All twelve zip codes had 100% wireless availability.

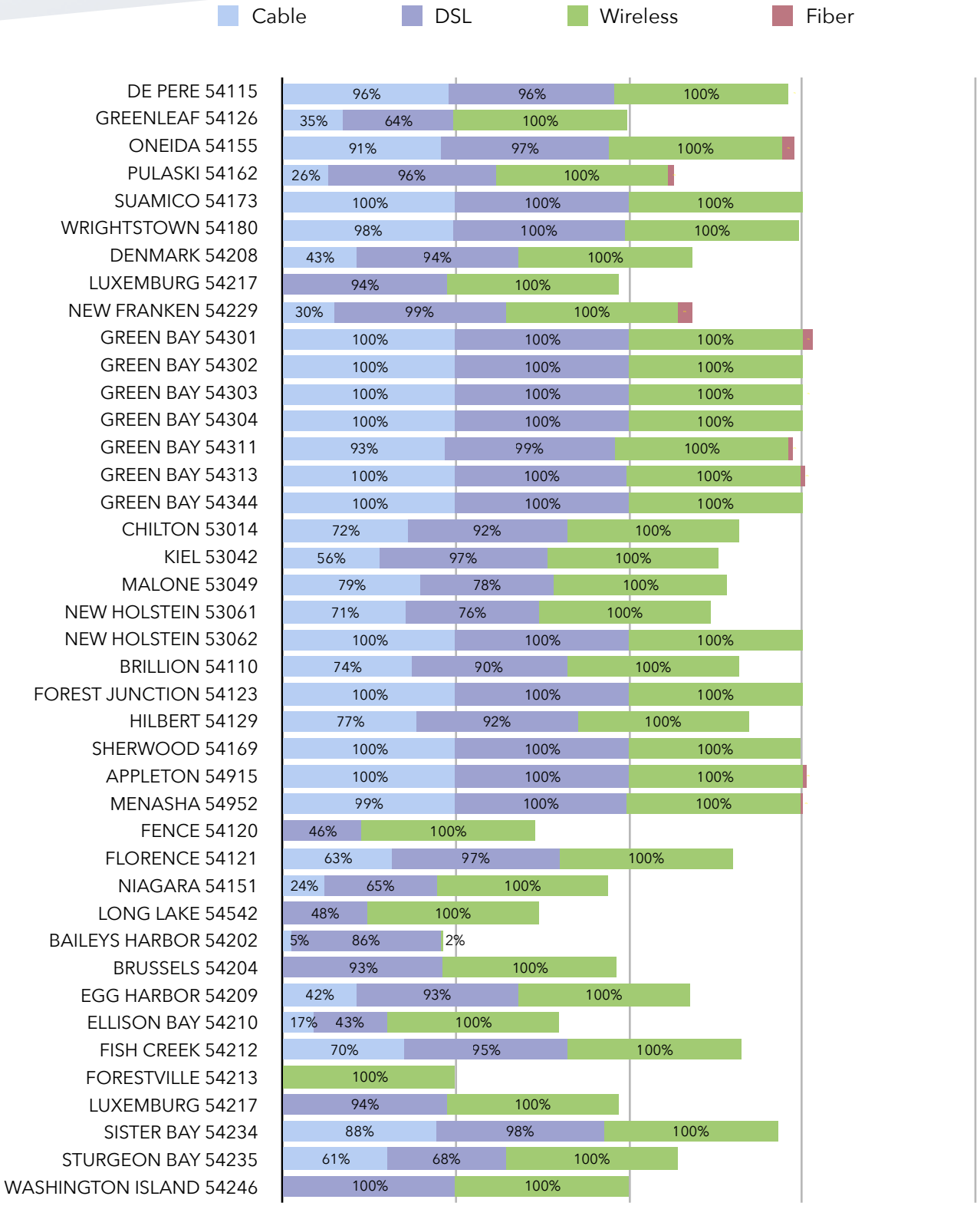
Waushara County

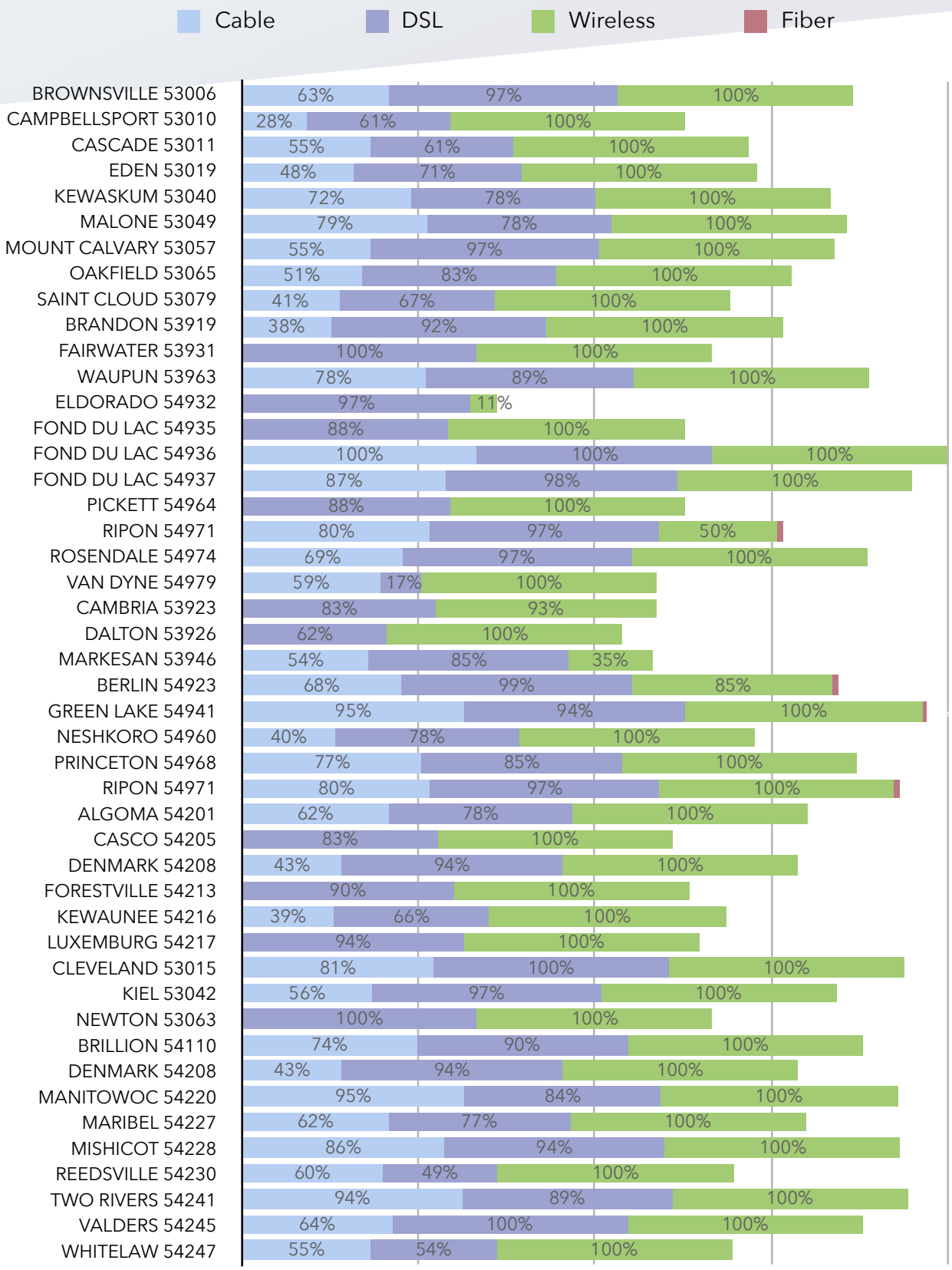
Three zip codes in Waushara County showed significant residential fiber. One, 54961, had a minor amount (2%) of fiber available. There were three zip codes, 54909, 54965 and 54967 with no cable availability. Eight other zip codes had less than 50% cable availability. All two of twelve zip codes had 100% wireless availability. Those two zip codes, 54923 and 54930, showed 84% wireless coverage.

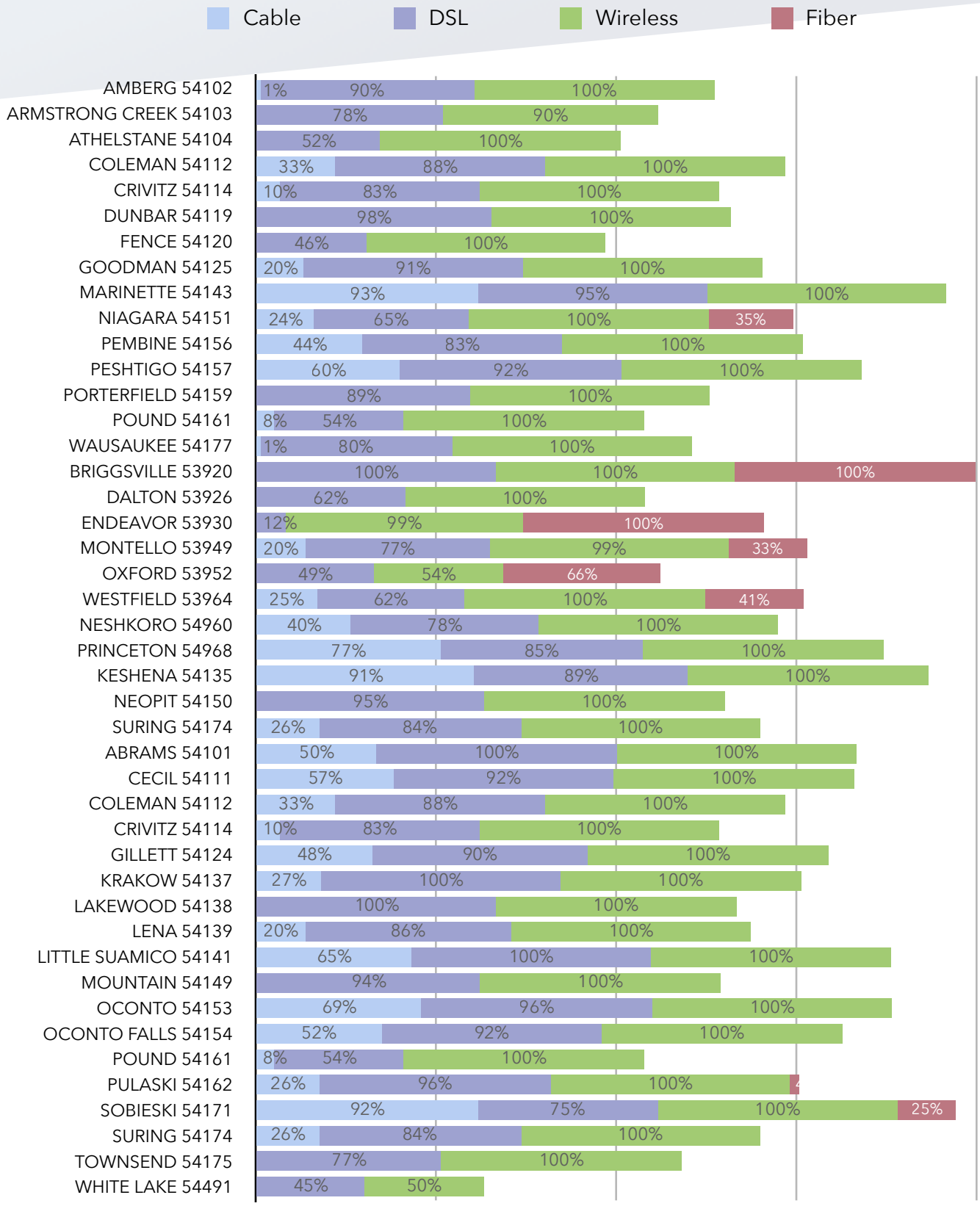
Winnebago County

Four zip codes in Winnebago County showed minor amounts of residential fiber. There was one zip code, 54964, with no cable availability. Two other zip codes had less than 50% cable availability. All thirteen zip codes had 100% wireless availability.

2.2 TECHNOLOGY TYPE AVAILABILITY BY ZIP CODE




Cable
DSL
Wireless
Fiber
BROWNSVILLE 53006 63% 97% 100%
CAMPBELLSPORT 53010 28% 61% 100%
CASCADE 53011 55% 61% 100%
EDEN 53019 48% 71% 100%
KEWASKUM 53040 72% 78% 100%
MALONE 53049 79% 78% 100%
MOUNT CALVARY 53057 55% 97% 100%
OAKFIELD 53065 51% 83% 100%
SAINT CLOUD 53079 41% 67% 100%
BRANDON 53919 38% 92% 100%
FAIRWATER 53931 100% 100%
WAUPUN 53963 78% 89% 100%
ELDORADO 54932 97% 11%
FOND DU LAC 54935 88% 100%
FOND DU LAC 54936 100% 100% 100%
FOND DU LAC 54937 87% 98% 100%
PICKETT 54964 88% 100%
RIPON 54971 80% 97% 50%
ROSENDALE 54974 69% 97% 100%
VAN DYNE 54979 59% 17% 100%
CAMBRIA 53923 83% 93%
DALTON 53926 62% 100%
MARKESAN 53946 54% 85% 35%
BERLIN 54923 68% 99% 85%
GREEN LAKE 54941 95% 94% 100%
NESHKORO 54960 40% 78% 100%
PRINCETON 54968 77% 85% 100%
RIPON 54971 80% 97% 100%
ALGOMA 54201 62% 78% 100%
CASCO 54205 83% 100%
DENMARK 54208 43% 94% 100%
FORESTVILLE 54213 90% 100%
KEWAUNEE 54216 39% 66% 100%
LUXEMBURG 54217 94% 100%
CLEVELAND 53015 81% 100% 100%
KIEL 53042 56% 97% 100%
NEWTON 53063 100% 100%
BRILLION 54110 74% 90% 100%
DENMARK 54208 43% 94% 100%
MANITOWOC 54220 95% 84% 100%
MARIBEL 54227 62% 77% 100%
MISHICOT 54228 86% 94% 100%
REEDSVILLE 54230 60% 49% 100%
TWO RIVERS 54241 94% 89% 100%
VALDERS 54245 64% 100% 100%
WHITELAW 54247 55% 54% 100%


Cable
DSL
Wireless
Fiber
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GOODMAN 54125
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PORTERFIELD 54159
POUND 54161
WAUSAUKEE 54177
BRIGGSVILLE 53920
DALTON 53926
ENDEAVOR 53930
MONTELLO 53949
OXFORD 53952
WESTFIELD 53964
NESHKORO 54960
PRINCETON 54968
KESHENA 54135
NEOPIT 54150
SURING 54174
ABRAMS 54101
CECIL 54111
COLEMAN 54112
CRIVITZ 54114
GILLETT 54124
KRAKOW 54137
LAKEWOOD 54138
LENA 54139
LITTLE SUAMICO 54141
MOUNTAIN 54149
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POUND 54161
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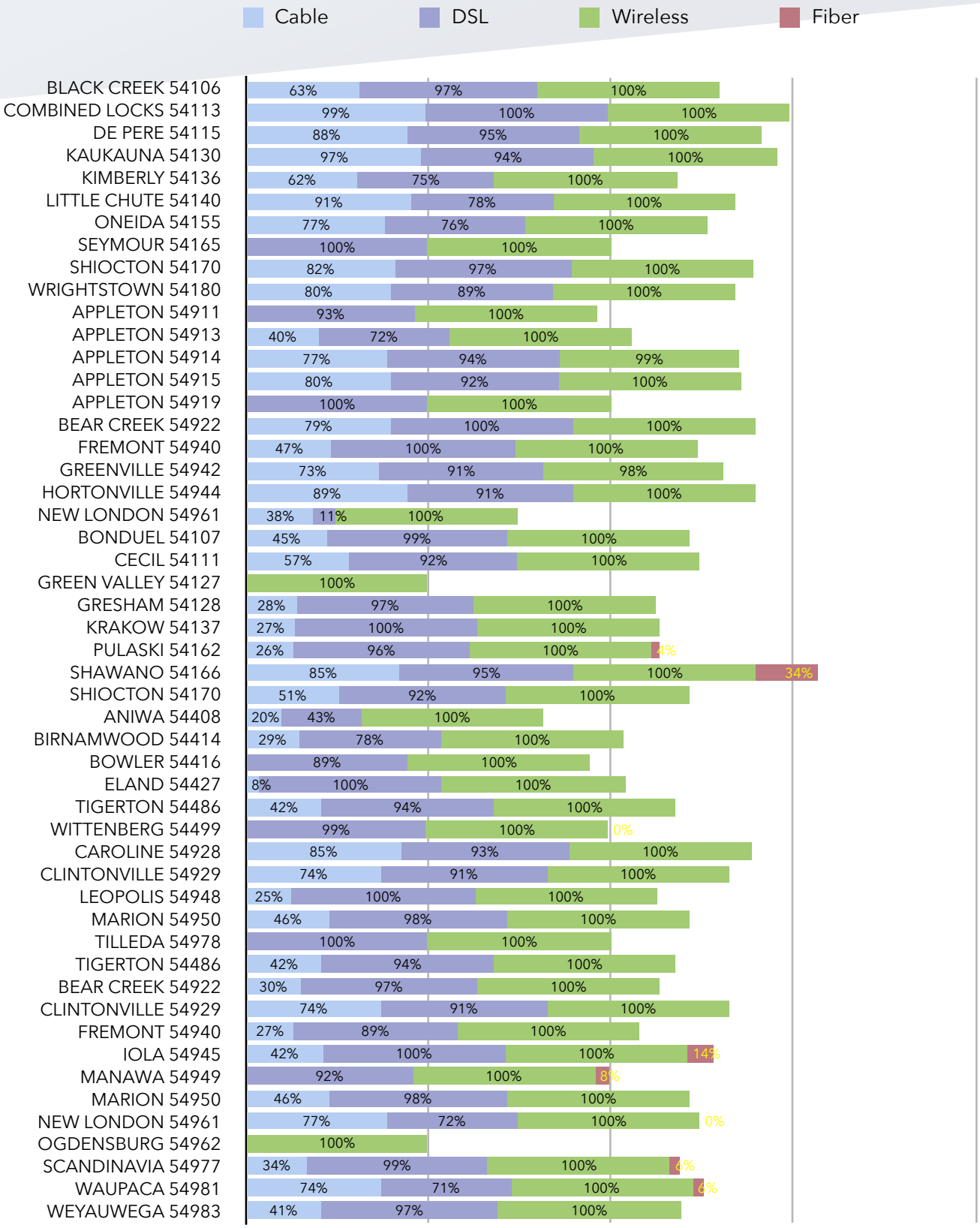
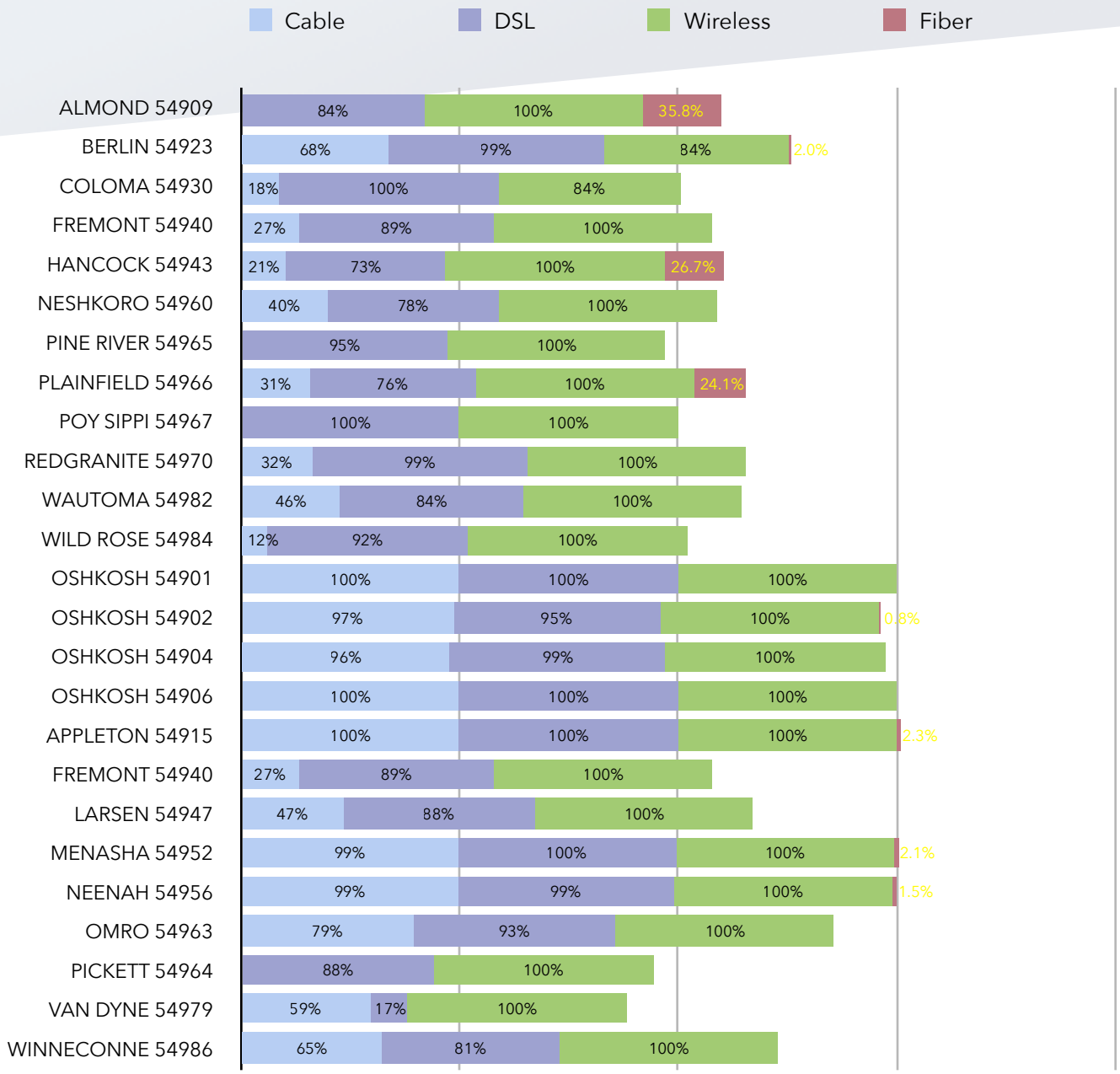
SOBIESKI 54171
SURING 54174
TOWNSEND 54175
WHITE LAKE 54491


Cable
DSL
Wireless
Fiber
BLACK CREEK 54106 63% 97% 100%
COMBINED LOCKS 54113 99% 100% 100%
DE PERE 54115 88% 95% 100%
KAUKAUNA 54130 97% 94% 100%
KIMBERLY 54136 62% 75% 100%
LITTLE CHUTE 54140 91% 78% 100%
ONEIDA 54155 77% 76% 100%
SEYMOUR 54165 100% 100%
SHIOCTON 54170 82% 97% 100%
WRIGHTSTOWN 54180 80% 89% 100%
APPLETON 54911 93% 100%
APPLETON 54913 40% 72% 100%
APPLETON 54914 77% 94% 99%
APPLETON 54915 80% 92% 100%
APPLETON 54919 100% 100%
BEAR CREEK 54922 79% 100% 100%
FREMONT 54940 47% 100% 100%
GREENVILLE 54942 73% 91% 98%
HORTONVILLE 54944 89% 91% 100%
NEW LONDON 54961 38% 11% 100%
BONDUEL 54107 45% 99% 100%
CECIL 54111 57% 92% 100%
GREEN VALLEY 54127 100%
GRESHAM 54128 28% 97% 100%
KRAKOW 54137 27% 100% 100%
PULASKI 54162 26% 96% 100% 4%
SHAWANO 54166 85% 95% 100% 34%
SHIOCTON 54170 51% 92% 100%
ANIWA 54408 20% 43% 100%
BIRNAMWOOD 54414 29% 78% 100%
BOWLER 54416 89% 100%
ELAND 54427 8% 100% 100%
TIGERTON 54486 42% 94% 100%
WITTENBERG 54499 99% 100% 0%
CAROLINE 54928 85% 93% 100%
CLINTONVILLE 54929 74% 91% 100%
LEOPOLIS 54948 25% 100% 100%
MARION 54950 46% 98% 100%
TILLEDA 54978 100% 100%
TIGERTON 54486 42% 94% 100%
BEAR CREEK 54922 30% 97% 100%
CLINTONVILLE 54929 74% 91% 100%
FREMONT 54940 27% 89% 100%
IOLA 54945 42% 100% 100% 14%
MANAWA 54949 92% 100% 8%
MARION 54950 46% 98% 100%
NEW LONDON 54961 77% 72% 100% 0%
OGDENSBURG 54962 100%
SCANDINAVIA 54977 34% 99% 100% 6%
WAUPACA 54981 74% 71% 100% 6%
WEYAUWEGA 54983 41% 97% 100%


Cable
DSL
Wireless
Fiber
ALMOND 54909
84%
100%
35.8%
BERLIN 54923
68%
99%
84%
2.0%
COLOMA 54930
18%
100%
84%
FREMONT 54940
27%
89%
100%
HANCOCK 54943
21%
73%
100%
26.7%
NESHKORO 54960
40%
78%
100%
PINE RIVER 54965
95%
100%
PLAINFIELD 54966
31%
76%
100%
24.1%
POY SIPPI 54967
100%
100%
REDGRANITE 54970
32%
99%
100%
WAUTOMA 54982
46%
84%
100%
WILD ROSE 54984
12%
92%
100%
OSHKOSH 54901
100%
100%
100%
OSHKOSH 54902
97%
95%
100%
0.8%
OSHKOSH 54904
96%
99%
100%
OSHKOSH 54906
100%
100%
100%
APPLETON 54915
100%
100%
100%
2.3%
FREMONT 54940
27%
89%
100%
LARSEN 54947
47%
88%
100%
MENASHA 54952
99%
100%
100%
2.1%
NEENAH 54956
99%
99%
100%
1.5%
OMRO 54963
79%
93%
100%
PICKETT 54964
88%
100%
VAN DYNE 54979
59%
17%
100%
WINNECONNE 54986
65%
81%
100%

2.3 PRICING SUMMARY BY PROVIDER

Summary of Service Provider Data - New North ISPs and WISPs

	Least Expensive Internet Only Service	Least Expensive Internet Only Service Meeting 25/3	Least Expensive Triple Pay Package Meeting 25/3
AT&T DSL	$65	Website Indicates AT&T no longer provides DSL- Legacy AT&T DSL accounts do exist	N/A
Amherst Telephone Company DSL	$74.99	N/A	N/A
CenturyLink DSL	$50	N/A	N/A
CEOM DSL	No information available		
Cirrinity (Wittenberg Telephone) DSL	$53.63	$93.63	N/A
Frontier DSL	$37.99	$44.99	$129.98
Marquette-Adams DSL	$24.95	$39.95	$147.95
Northern Telephone and Data DSL	$29.95	N/A	N/A
Nsight Teleservices DSL	$47.95	$51.90	$202.41
Solarus DSL	$49.95	N/A	N/A
TDS (Bend) Telecom DSL	$67.95	$67.95	$162.03
Union Company DSL	$29.95	N/A	N/A
Astrea Cable	$40	$40	N/A
Mediacom Cable	$29.99	$29.99	$189.99
Spectrum Cable	$74.95	$74.95	$176.96
Xfinity Cable	$50	$50	$116
Amherst Telephone Company Fiber	$74.99	$74.99	$169.85
AT&T Fiber	$35	$35	N/A
CenturyLink Fiber <1% availability	$30	$30	N/A
CEOM Fiber	$49.95	$49.95	$93.85

	Least Expensive Internet Only Service	Least Expensive Internet Only Service Meeting 25/3	Least Expensive Triple Pay Package Meeting 25/3
Cirrinity (Wittenberg Telephone) Fiber	$60.63	$60.63	Pricing Unavailable
Luxemburg CEOM Fiber	$49.95	$49.95	$93.85
Marquette-Adam Fiber	$59.95	$59.95	$173.95
Northern Tel & Data Fiber <2% availability	No Information available		
Solarus Fiber	$49.99	$49.99	$183.99
Union Telephone Company Fiber	$44.95	$44.95	$158.90
Bertram Wireless	$59.95	$149.95	N/A
Bertram Wireless 50 Mbps	No pricing available without exact address		
Bug Tussle Wireless	$59.99	$89.99	N/A
CEOM Wireless	$10	N/A	N/A
Cirrinity (Wittenberg Cable) Wireless	No information without exact address		
Door County Wireless	$59.95	$209.95	N/A
Ethoplex Wireless	$50	$100	N/A
Excel.Net Wireless	$19.99	$89.99	N/A
Fast Air Wireless	$25	N/A	N/A
King Street Wireless	No information available	N/A	N/A
Mercury Network Wireless	$50	$50	N/A
Network Professionals Wireless	$39.99	$129.99	N/A
Netwurk Wireless	$62.45	$129.95	N/A
Northern Telephone and Data Wireless	N/A	N/A	N/A

	Least Expensive Internet Only Service	Least Expensive Internet Only Service Meeting 25/3	Least Expensive Triple Pay Package Meeting 25/3
TDS TELECOM (Bend Broadband) Wireless	No information available	N/A	N/A
Waupaca Online Wireless City	$25	$75	N/A
Waupaca Online Wireless Rural	$45	$95	N/A
Waupaca Online Wireless Extended	$50	$100	N/A
HughesNet	$59.99	$59.99	N/A
Viasat	$84.99	$119.99	N/A
Starlink	$99	$99	N/A

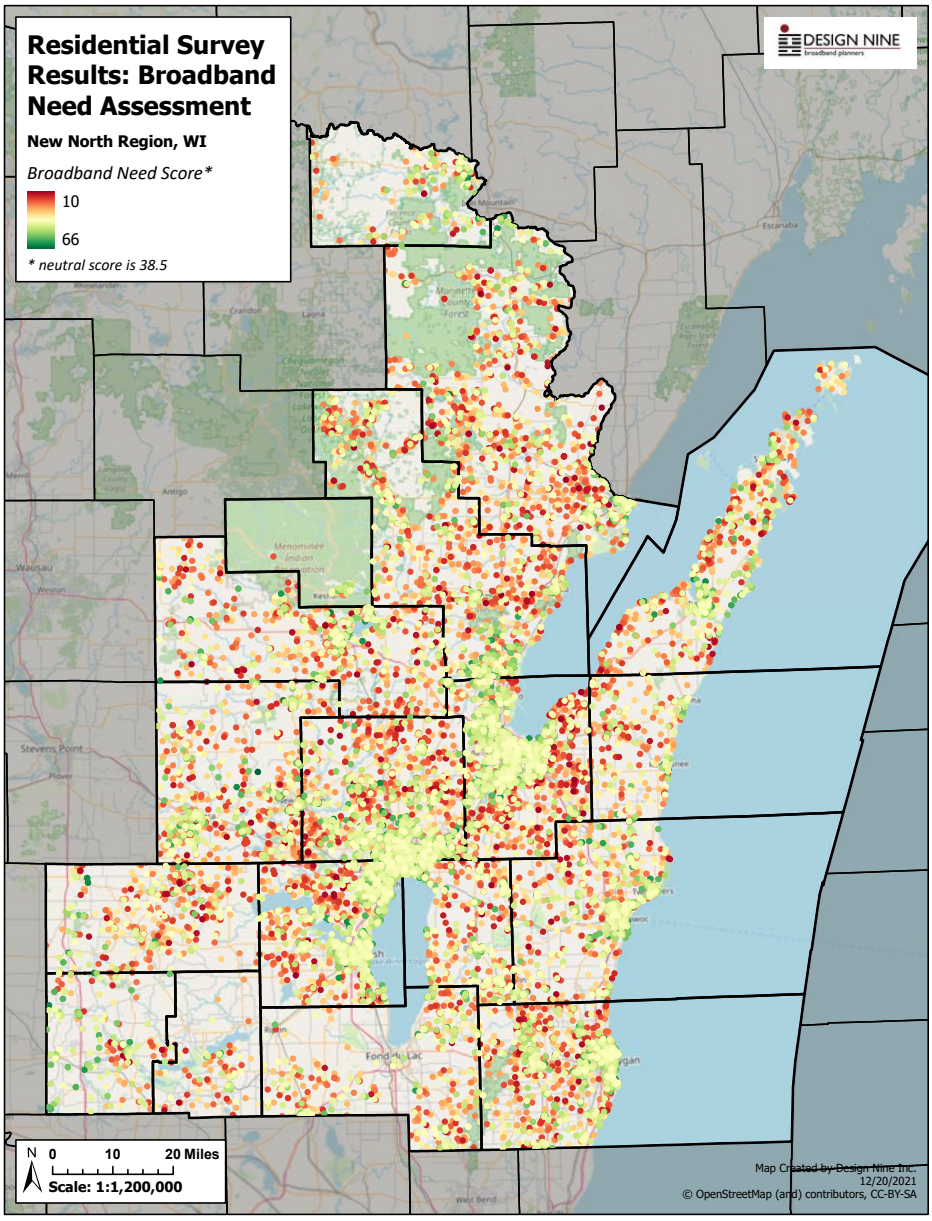
3 NEW NORTH REGIONAL SURVEY RESULTS

During the fall of 2021, a broadband survey was conducted in the New North region of Wisconsin as part of a region wide study in broadband needs. The online (Web) version of the survey was publicized on social media, County Web sites, and a Postal Service mailing to all households. Residents were encouraged to complete the survey online or fill out and return the paper version by surface mail. Businesses were encouraged to complete a separate business-focused survey, and the results of that are included later in this report.

A total of 17,004 responses were collected in the residential survey—roughly 3% of all households in The New North region responded to the survey. Not all responders answered every question. Note that because of rounding, not all percentages sum exactly to 100%. Many comments were received and are available as a separate document.

Survey responses included the street address of the respondent, and all responses were geo-coded. By geo-coding responses, areas of higher need (i.e. poorer broadband service/speeds) can be identified.

Key survey data responses were ranked and weighted to help identify areas of need. In the map below, need scores range between ten and sixty-six, with 38.5 as a median or "neutral need" score. So survey address points that range in color from yellow to bright red identify users with lower than median broadband service and speed quality.



The chosen factors are: Q9-Download Speed, Q6-Internet Technology type, Q7-"No other options for internet" selection, Q12-Speed Satisfaction, Q13-Reliability satisfaction, Q4-Cost for Broadband, Q21-work from home requirement, & Q1-"I need better internet" responses.

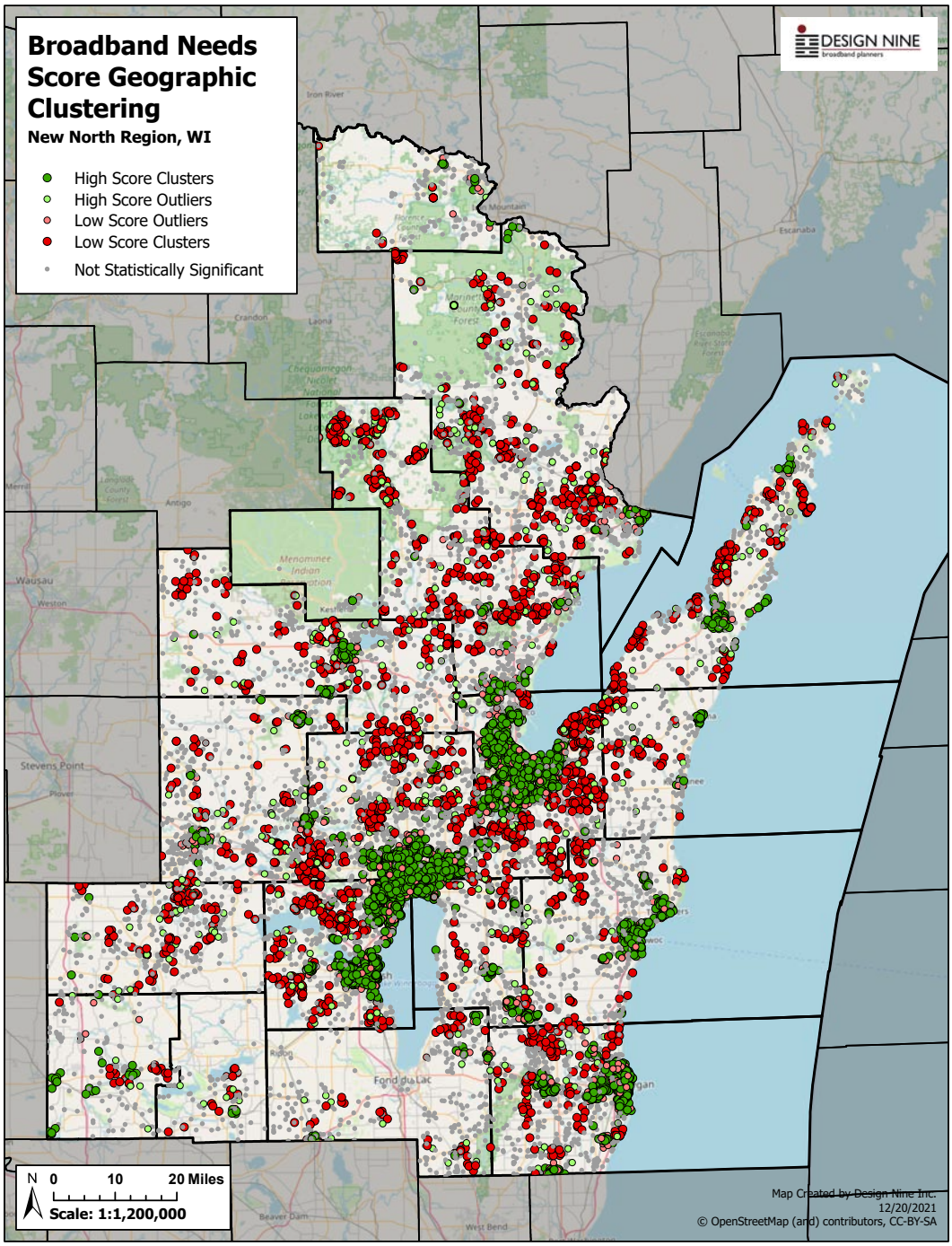
Factors with increased weight in the model:

- Internet technology type
- Need to work from home
- Not having access to other options for internet service

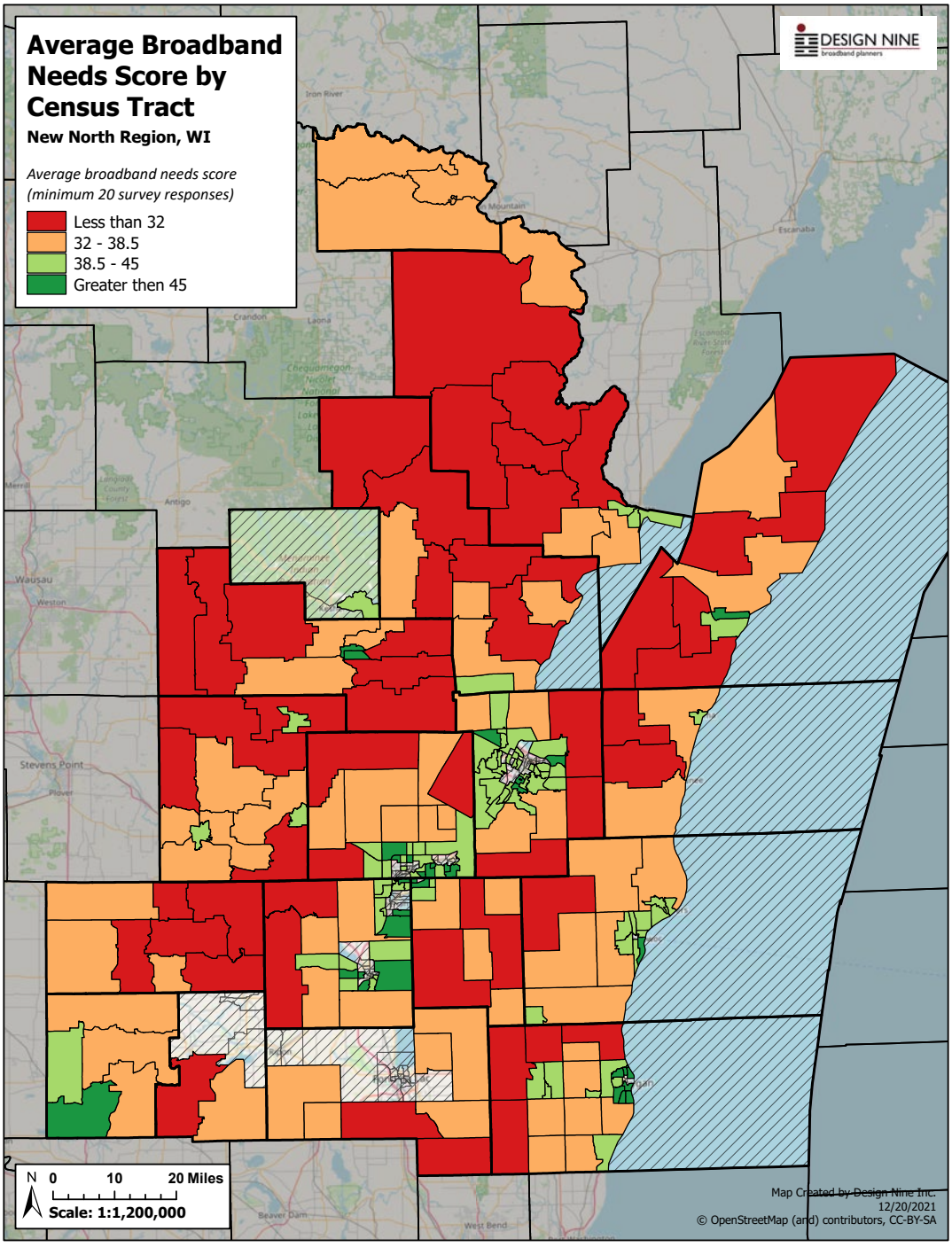
Factors with decreased weight in the model:

- Satisfaction with internet speed
- Satisfaction with internet reliability

After the initial weighting and ranking calculations were computed in the previous map, a clustering analysis was applied to highlight clusters of low/poor Internet service/speed. Areas of bright green represent adequate broadband service, and areas of bright red indicate areas of high need. In some rural areas, the response rate to the survey was too low to identify clusters, but that should not be interpreted as areas of adequate service.



After the cluster analysis was completed, the cluster data was used to map areas of need by census tract. Areas of red and orange indicate lower than average broadband service and speed quality. These area would be candidates for using grant funds to improve service and to develop public/ private partnerships with local and regional ISPs and WISPs to make investments in improved Internet and broadband infrastructure.



3.1 DISTRIBUTION OF RESIDENTIAL SURVEY RESPONSES

Some of the key findings from the residential results are listed below.

88% of respondents are interested in faster and more reliable Internet service

50% of residents are "dissatisfied" or "very dissatisfied" with current Internet speeds

96% of respondents said that the N.N. Region or their County government should help facilitate better broadband

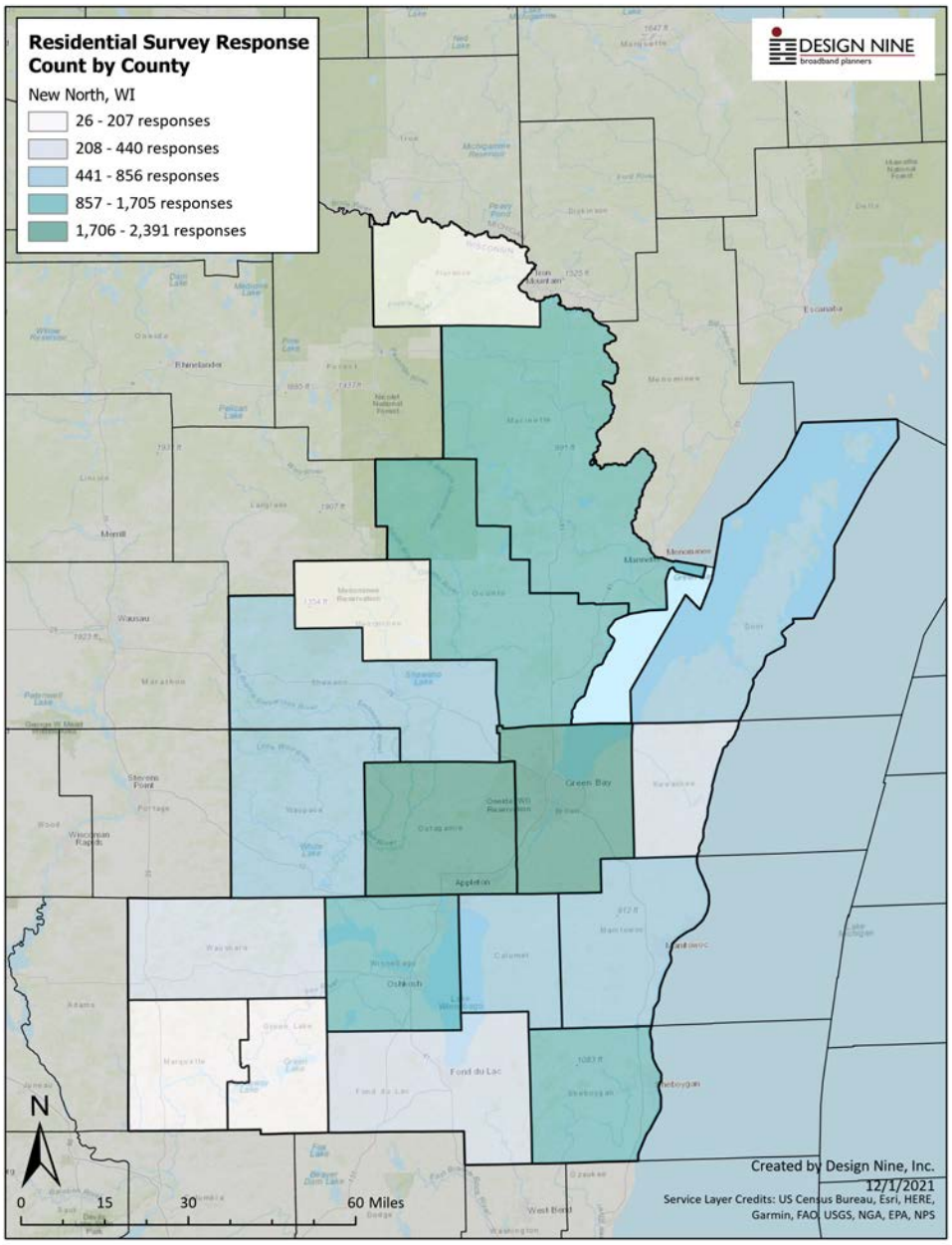
33% of residents have 9 or more Internet-connected devices in their home

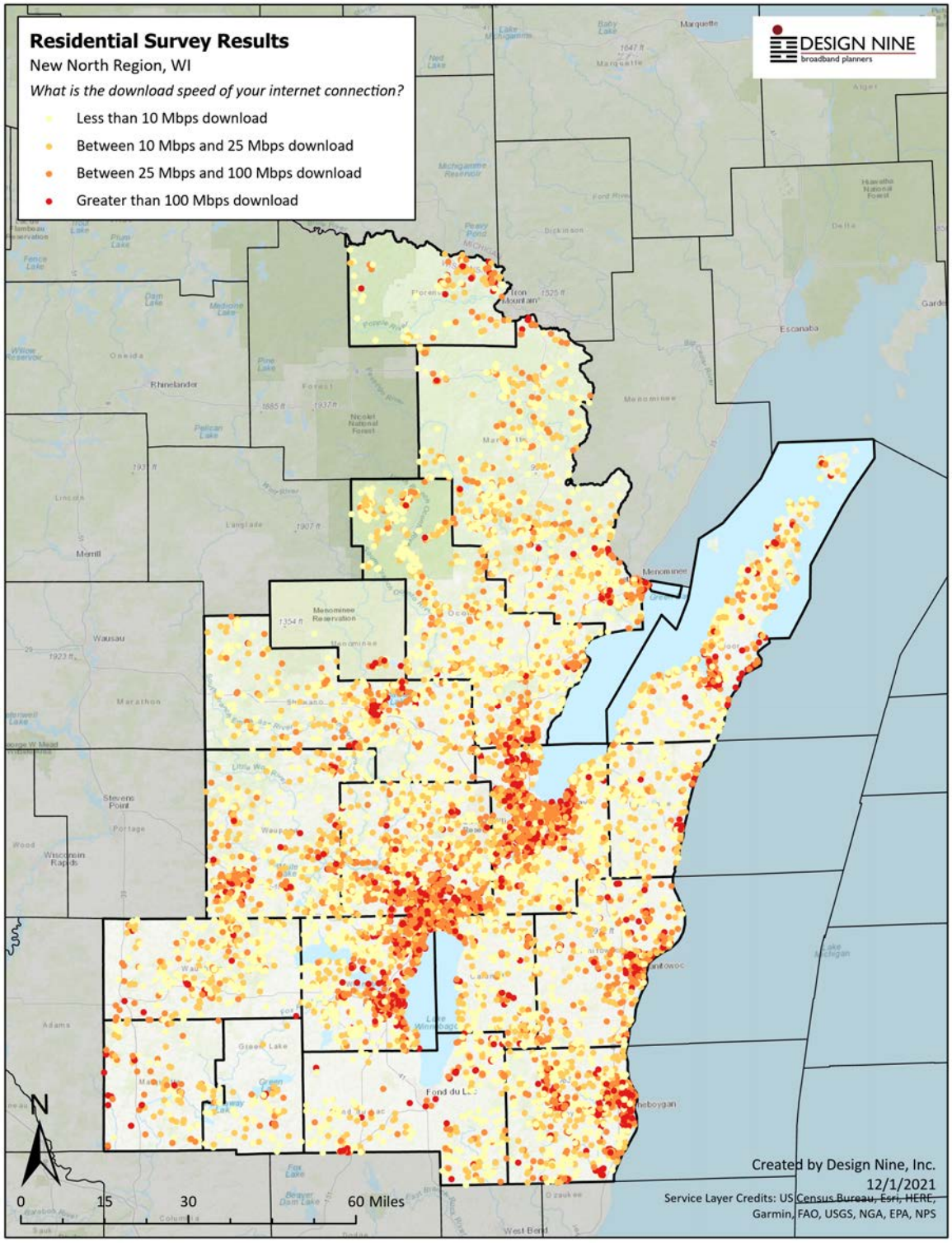
60% of respondents report they have trouble using common Internet services

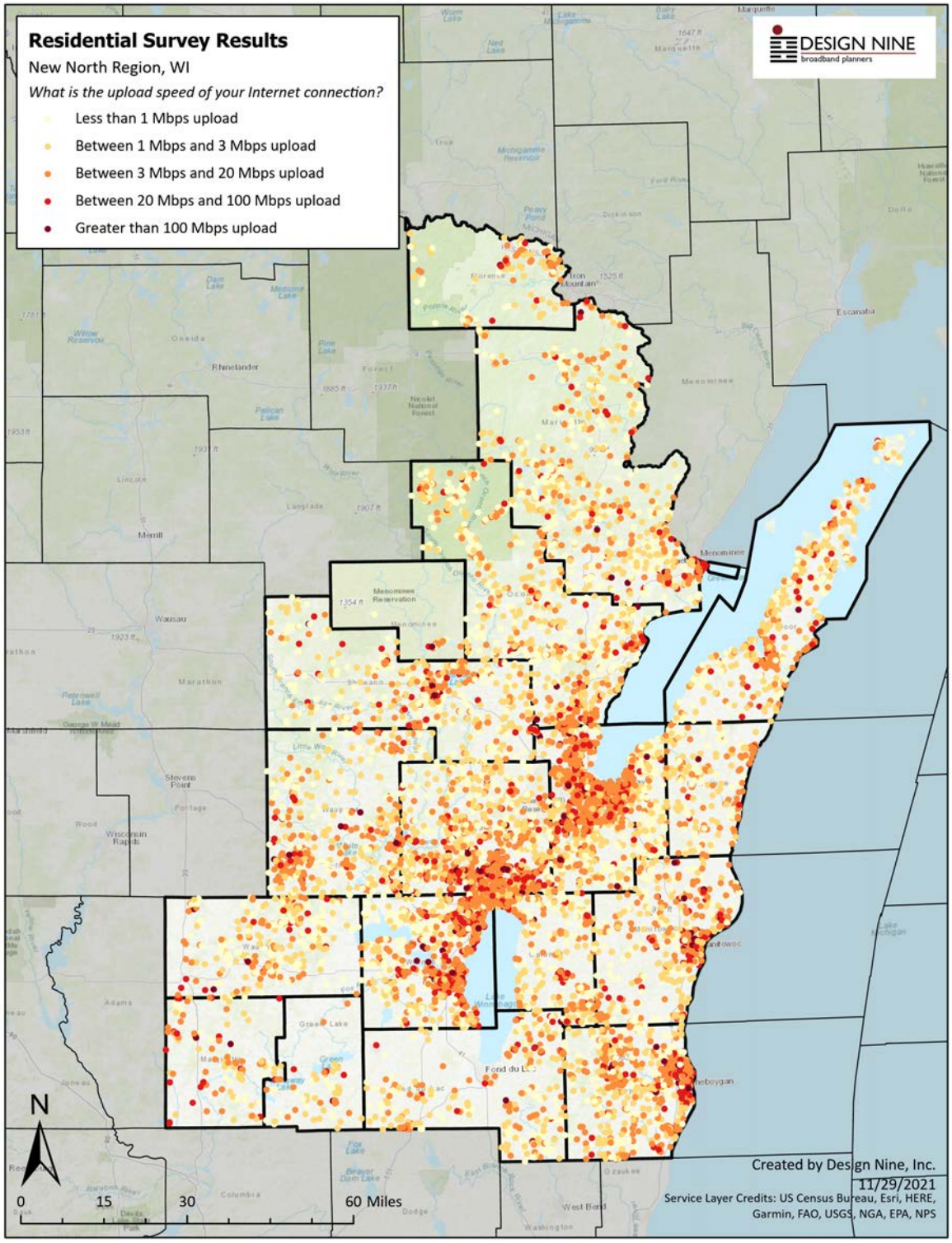
35% indicate that availability of broadband Internet is affecting where they choose to live

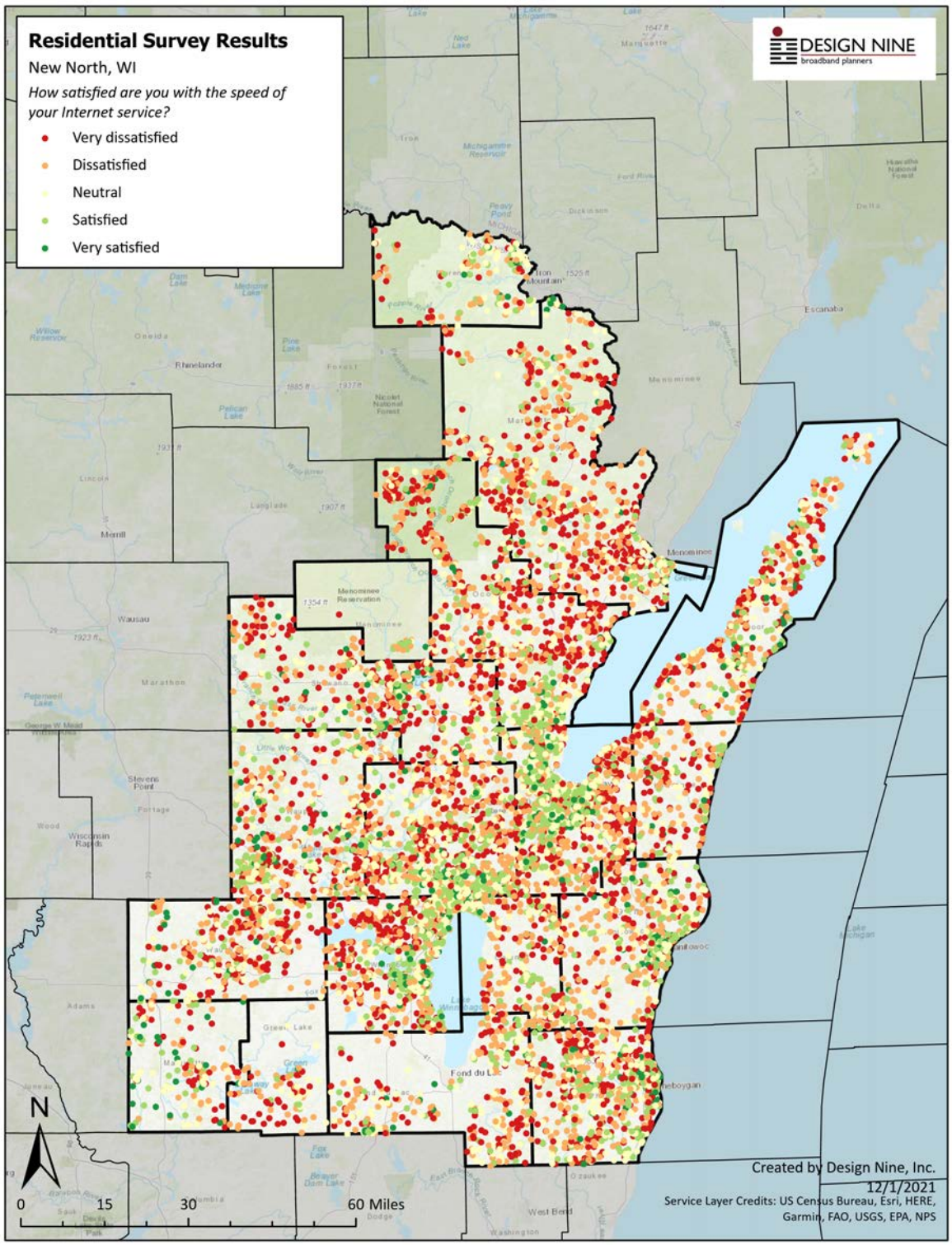
The maps on the following pages illustrate the responses by residential users to key questions on the survey:

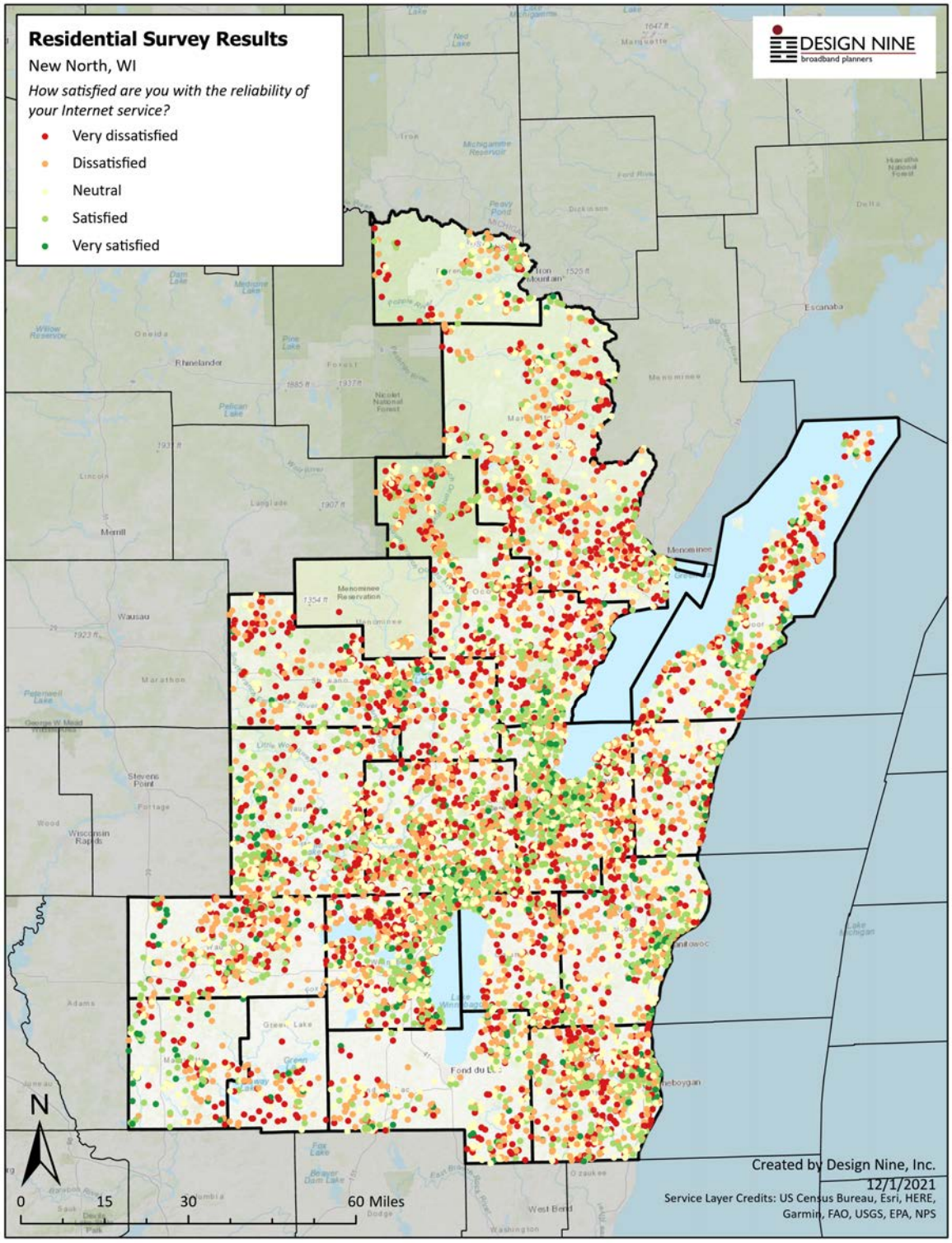
- The number of responses received from each county.
- The reported download speeds.
- The reported upload speeds.
- Satisfaction with current Internet speed.
- Satisfaction with the reliability of their Internet service.




Residential Survey Results
New North Region, WI
What is the download speed of your internet connection?
Less than 10 Mbps download
Between 10 Mbps and 25 Mbps download
Between 25 Mbps and 100 Mbps download
Greater than 100 Mbps download
DESIGN NINE
broadband planners
N
0
15
30
60 Miles
Created by Design Nine, Inc.
12/1/2021
Service Layer Credits: US Census Bureau, Esri, HERE, Garmin, FAO, USGS, NGA, EPA, NPS

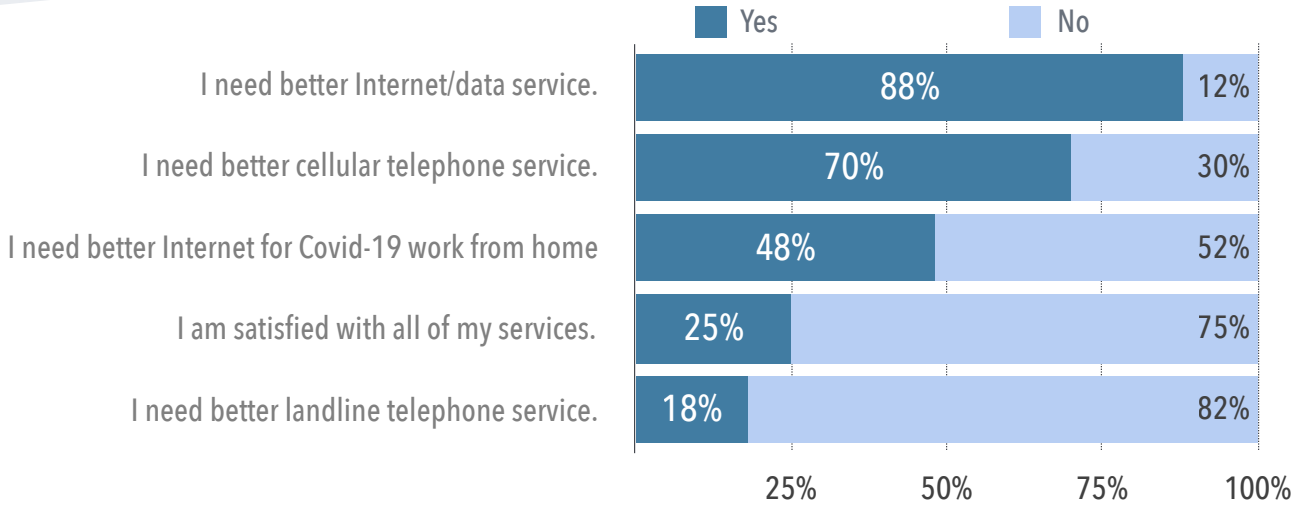

Residential Survey Results
New North Region, WI
What is the upload speed of your Internet connection?
Less than 1 Mbps upload
Between 1 Mbps and 3 Mbps upload
Between 3 Mbps and 20 Mbps upload
Between 20 Mbps and 100 Mbps upload
Greater than 100 Mbps upload
DESIGN NINE
broadband planners
N
0
15
30
60 Miles
Created by Design Nine, Inc.
11/29/2021
Service Layer Credits: US Census Bureau, Esri, HERE, Garmin, FAO, USGS, NGA, EPA, NPS


Residential Survey Results
New North, WI
How satisfied are you with the speed of your Internet service?
Very dissatisfied
Dissatisfied
Neutral
Satisfied
Very satisfied
DESIGN NINE
broadband planners
N
0
15
30
60 Miles
Created by Design Nine, Inc.
12/1/2021
Service Layer Credits: US Census Bureau, Esri, HERE, Garmin, FAO, USGS, EPA, NPS


Residential Survey Results
New North, WI
How satisfied are you with the reliability of your Internet service?
Very dissatisfied
Dissatisfied
Neutral
Satisfied
Very satisfied
DESIGN NINE
broadband planners
N
0
15
30
60 Miles
Created by Design Nine, Inc.
12/1/2021
Service Layer Credits: US Census Bureau, Esri, HERE, Garmin, FAO, USGS, EPA, NPS

3.2 RESIDENTIAL SURVEY SUMMARY DATA

1. Select the items you agree with below



2a. Total number of adults in household

None	1	2	3	4	5	6	7+
12	2408	11314	1342	517	121	30	20
0%	15%	72%	9%	3%	1%	0%	0%

2b. Total number of K-12 Students in the house hold

None	1	2	3	4	5	6	7+
11262	1537	1443	562	146	40	11	12
75%	10%	10%	4%	1%	0%	0%	0%

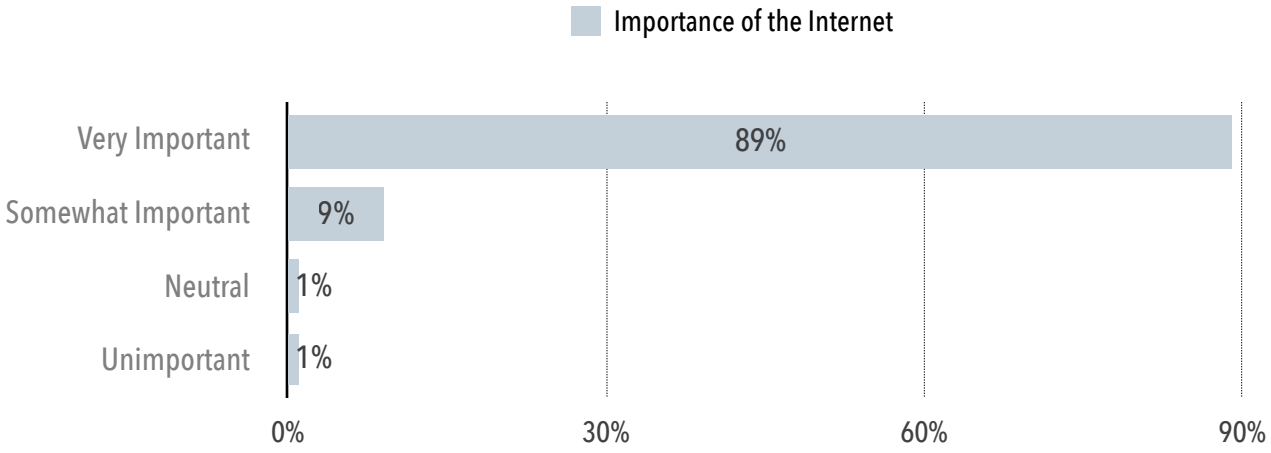
2c. Total number of college students in household

None	1	2	3	4	5	6	7+
13140	1438	303	33	8	1	1	1
88%	10%	2%	0%	0%	0%	0%	0%

2d. How many total Internet users in household

None	1	2	3	4	5	6	7+
195	2177	7771	1944	1948	788	271	147
1%	14%	51%	13%	13%	5%	2%	1%

3. How important is Internet access to you or your household?



4. How much do you spend each month for ALL telecom services? This would include any fees for services like phone, TV, and Internet. Do not include cellphones.

$50 or less	$50 to $75	$75 to $100	$100 to $150	$150 to $200	More than $200/month
1,409	1,932	2,851	3,408	2,992	3,092
9%	12%	18%	22%	19%	20%

5. How much do you pay just for Internet access each month?

No Internet	I only use free hotspots	$10 to $20	$21 to $40	$41 to $60	$61 to $80	More than $80/ month	I don't know
610	187	161	845	4,115	5,396	3,747	645
4%	1%	1%	5%	26%	34%	24%	4%

6. What type of Internet do you have at home?

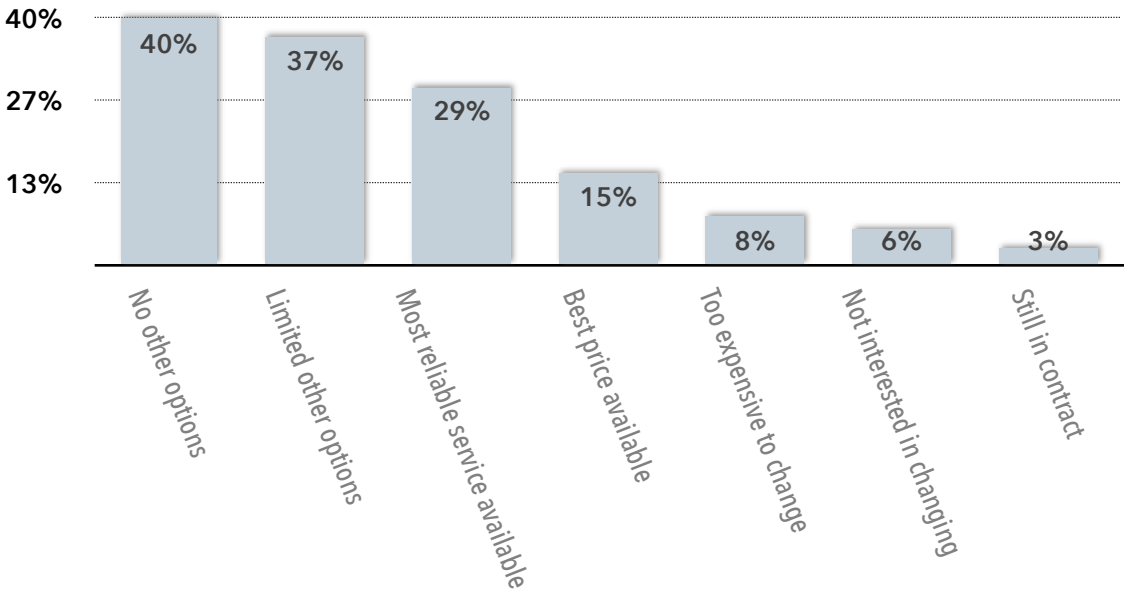
Cable modem	5,610	36%
DSL line	2,923	19%
Satellite	1,733	11%
Cellular wireless	1,433	9%
I don't know	1,245	8%
Wireless ISP	1,105	7%
Fiber	553	4%
Other	479	3%
No Internet	478	3%
Dial-up	95	1%

Other internet types responses:

Many comments were received. Because of the volume of replies, these comments can be found in a separate document.

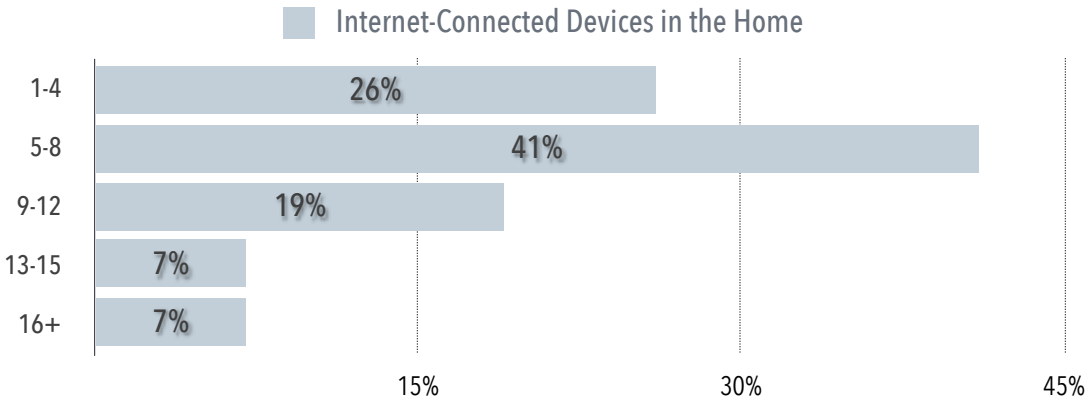
7. Based on the type of Internet connection you selected above, why do you still have it? (select all that apply)

40% of respondents indicated they have no alternative to their current Internet provider



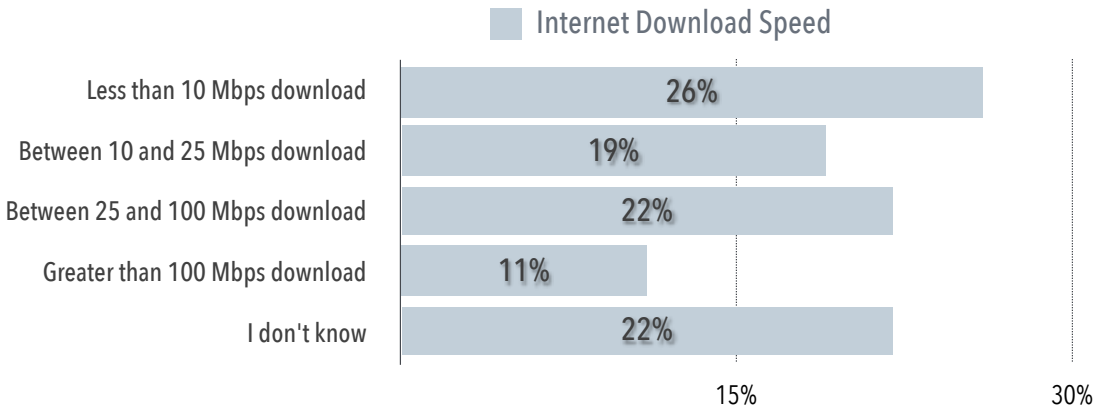
8. How many devices (for example computers, cellphones, smart TVs) connect to the Internet in your household?

33% of residents have 9 or more Internet-connected devices in their home



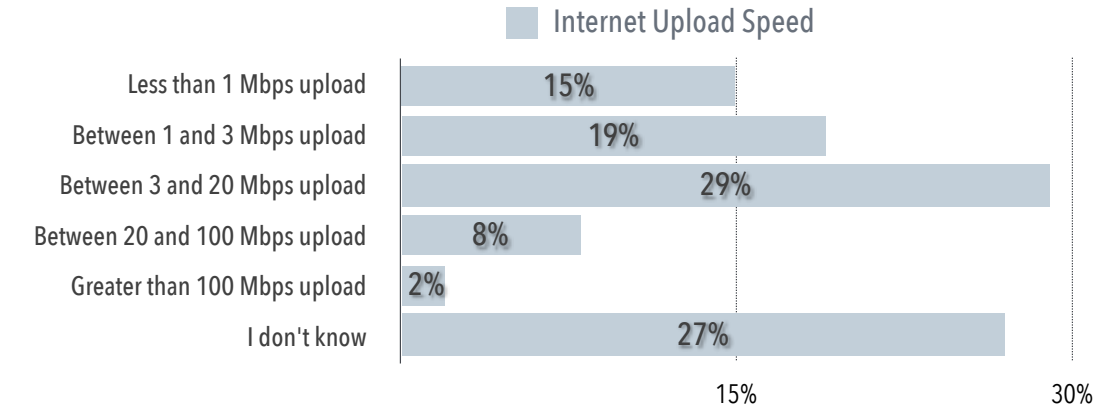
9. What is the download speed of your Internet Connection?

Only 33% of residents can confirm that they have Internet service that meets the FCC definition of adequate broadband service (25 Meg down, 3 Meg up). It is not unusual that many respondents do not know their exact Internet speeds.



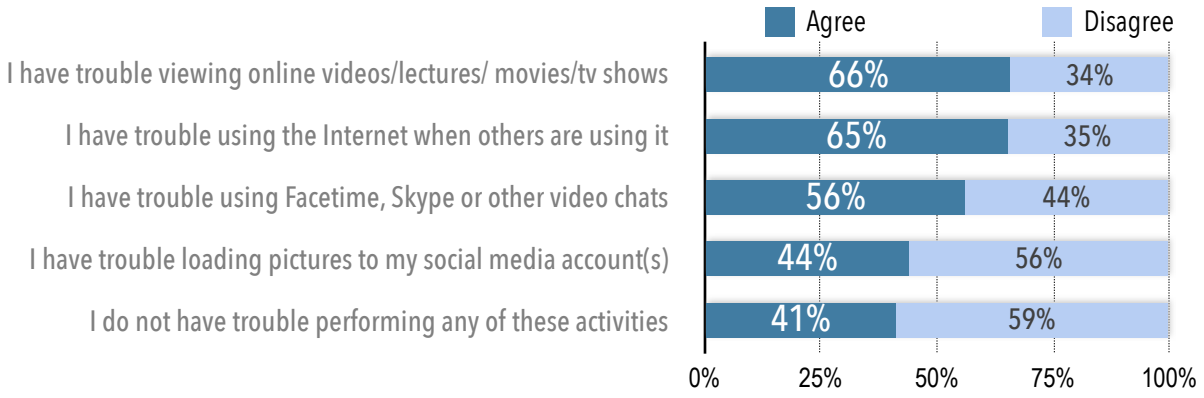
10. What is the upload speed of your Internet Connection?

Only 10% of residents have Internet service that meets the FCC definition of adequate broadband service (25 Meg down, 3 Meg up). It is not unusual that many respondents do not know their exact Internet speeds.

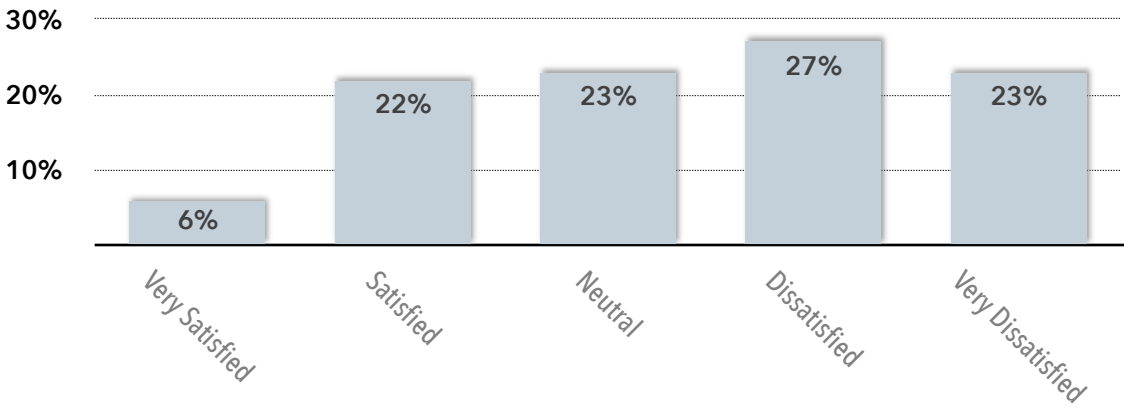


11. Select the items you agree with below

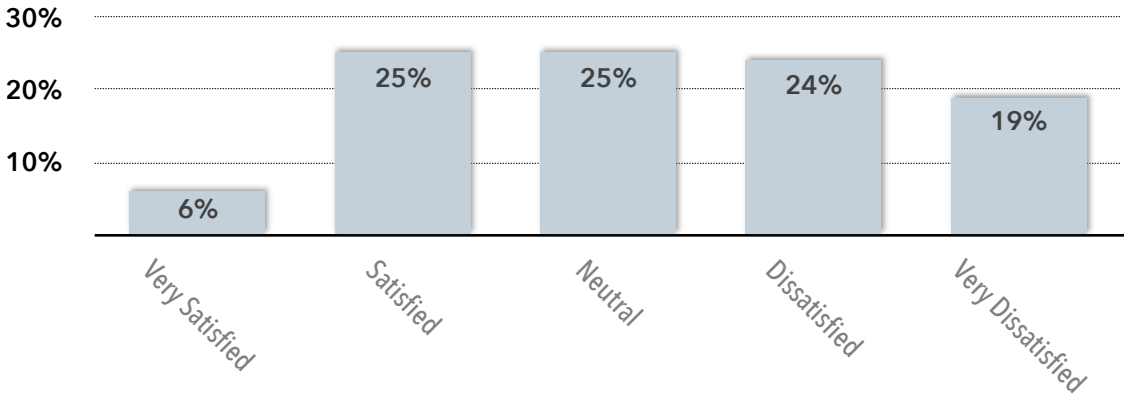
More than 60% of respondents report they have trouble using common Internet services



12. How satisfied are you with the speed of your internet service?



13. How satisfied are you with the reliability of your internet service?



14. Select all items you use the Internet for now

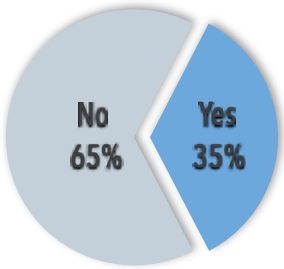
Streaming video and TV services (Netflix, Hulu, Disney, etc.)	11,883	75%
Online Backup (files, photos, music)	9,429	59%
VoIP Internet phone (Vonage, Skype, FaceTime, etc.)	7,699	49%
Work from home during Covid-19 pandemic	6,943	44%
Learn about Covid-19 pandemic issues and information	6,847	43%
Smart speakers (Alexa, Homepod, Google Assistant, etc.)	6,194	39%
Homework/Schoolwork/Distance learning	5,999	38%
Telemedicine or tele-health	5,457	34%
Home security (cameras, video doorbells, etc.)	4,616	29%
Online gaming	4,345	27%
Other	2,086	13%

Other internet types responses:

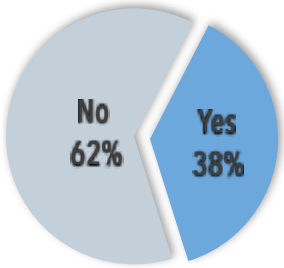
Many comments were received. Because of the volume of replies, these comments can be found in a separate document.

15. High speed, affordable Internet influences where I choose to live?

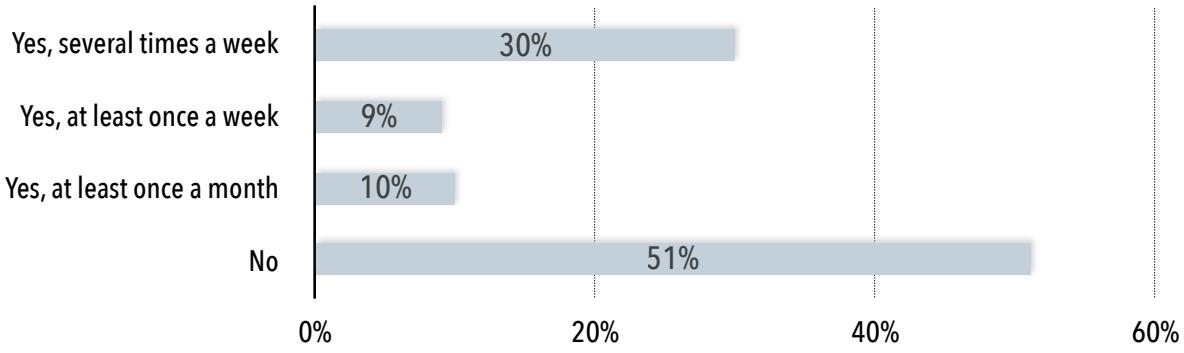
Availability of broadband Internet is affecting where people choose to live. The response of of 35% is typical of many communities. Internet availability can impact home prices and community development.



16. Has the Covid-19 crisis had a negative economic impact on your household?



17. Does anyone in your household use / need the Internet to complete school assignments, participate in distance learning, or receive job training course work?

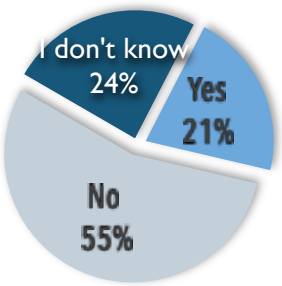


18. Who is your Internet Service provider?

Some responses included more than one provider.

Spectrum	5,696	35%
CenturyLink	2,145	13%
Other	1,768	11%
AT&T	1,437	9%
Satellite Internet	752	5%
Frontier	690	4%
Night	451	3%
CellComm	448	3%
Verizon	446	3%
US Cellular	380	2%
Cellphone Hotspot	355	2%
Bertram	304	2%
TDS	249	2%
Comcast	208	1%
Bugtussel	186	1%
Star Comm	161	1%
Astrea	152	1%
Door City Broadband	100	1%
Wireless Internet	53	0%
Waupaca Online	28	0%
Cirrinity	26	0%
NextGen	8	0%
SonicNet	7	0%
Airstream	2	0%
Northwest	2	0%
Select Comm	2	0%
Spring Valley Telephone	1	0%

19. Do you have data limits (caps) on your current Internet service?

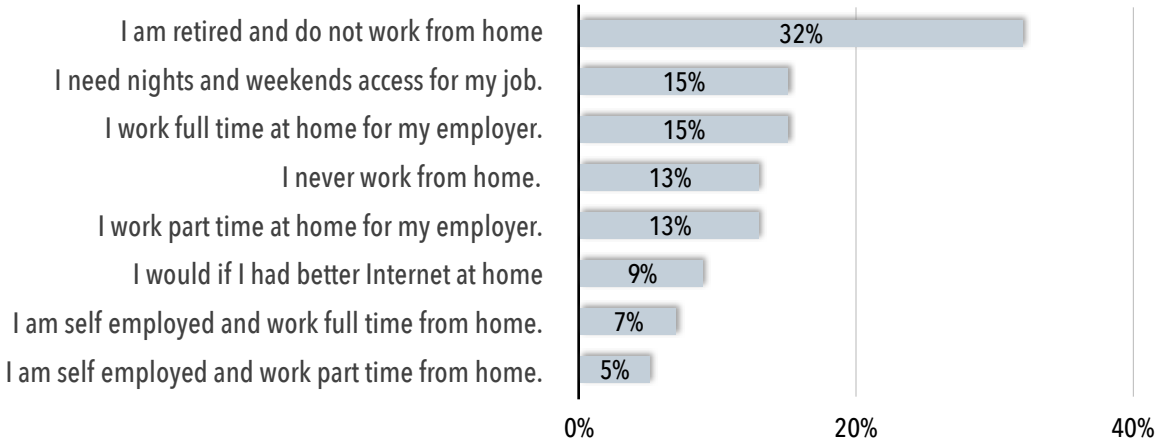


20. If you have data caps, have you exceeded those caps?

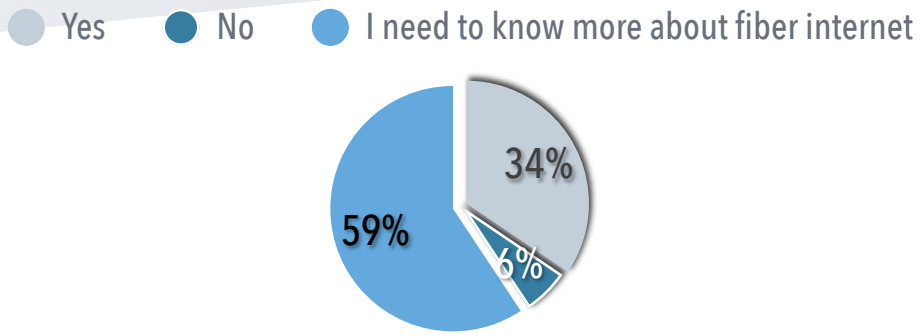
Yes	15%
No	18%
I do not have data caps	23%
I don't know	45%

21. Do you work from home?

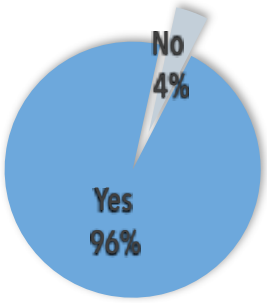
55% report working from home part or full time—the Internet has made residential neighborhoods into business districts. Home-based jobs and businesses reduce traffic congestion and reduce road maintenance. This is also a high number relative to past surveys we have conducted, and undoubtedly the Covid crisis has caused this number to rise.



22. Are you Interested in Gigabit fiber Internet Service?



23. Should the New North and/or your county government facilitate better broadband services and more affordable services?



24. Any Other Comments

Many comments were received. Because of the volume of replies, these comments can be found in a separate report.

3.3 BUSINESS SURVEY RESULTS

During the fall of 2021, a broadband business survey was conducted in the region of New North, Wisconsin as part of a multi-county wide study in broadband needs. The online (Web) version of the survey was publicized on social media. Businesses were encouraged to complete the survey online or fill out and return the paper version by surface mail. A total of 427 responses were were collected from businesses in the Region. Not all responders answered every question. Some key findings from the results are listed below.

82% of business respondents want better Internet access

95% of respondents said that they believe the N.N. Region or their County government should help facilitate better broadband

98% indicated that the Internet is important to the success of their business over the next five years

Only 27% of businesses are "satisfied" or "very satisfied" with the speed of their current Internet service

32% of the businesses that responded are home-based

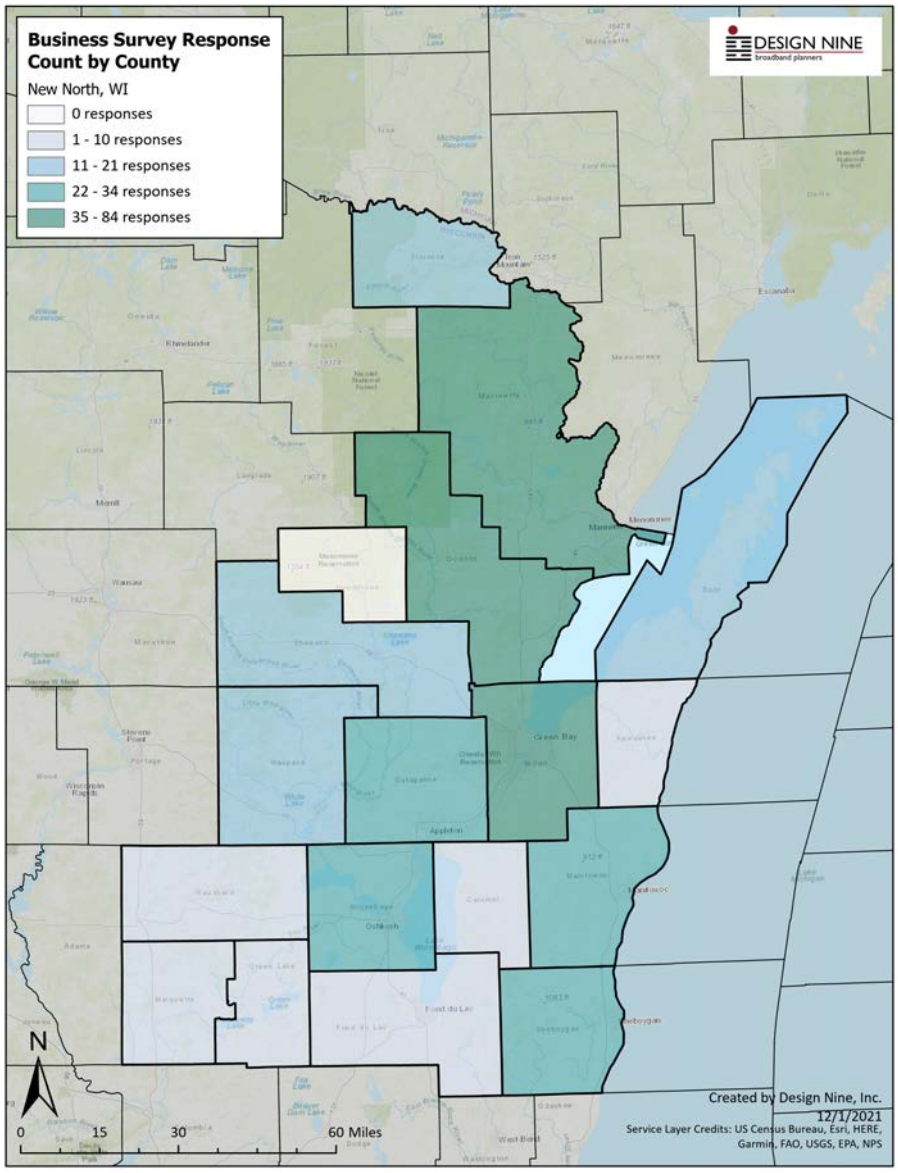
71% of businesses that responded need employees to be able to work from home

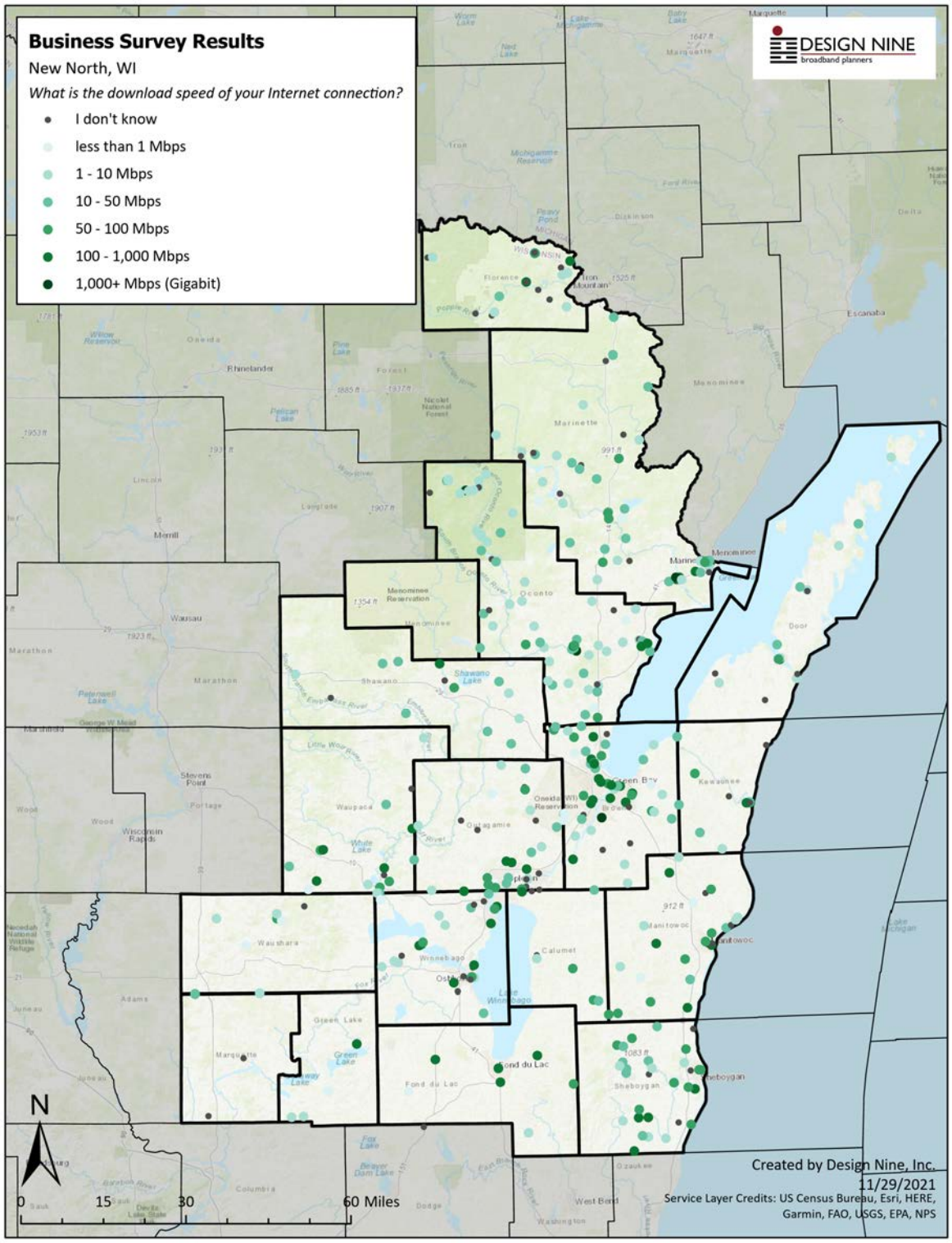
Home-based workers and businesses need affordable Internet access

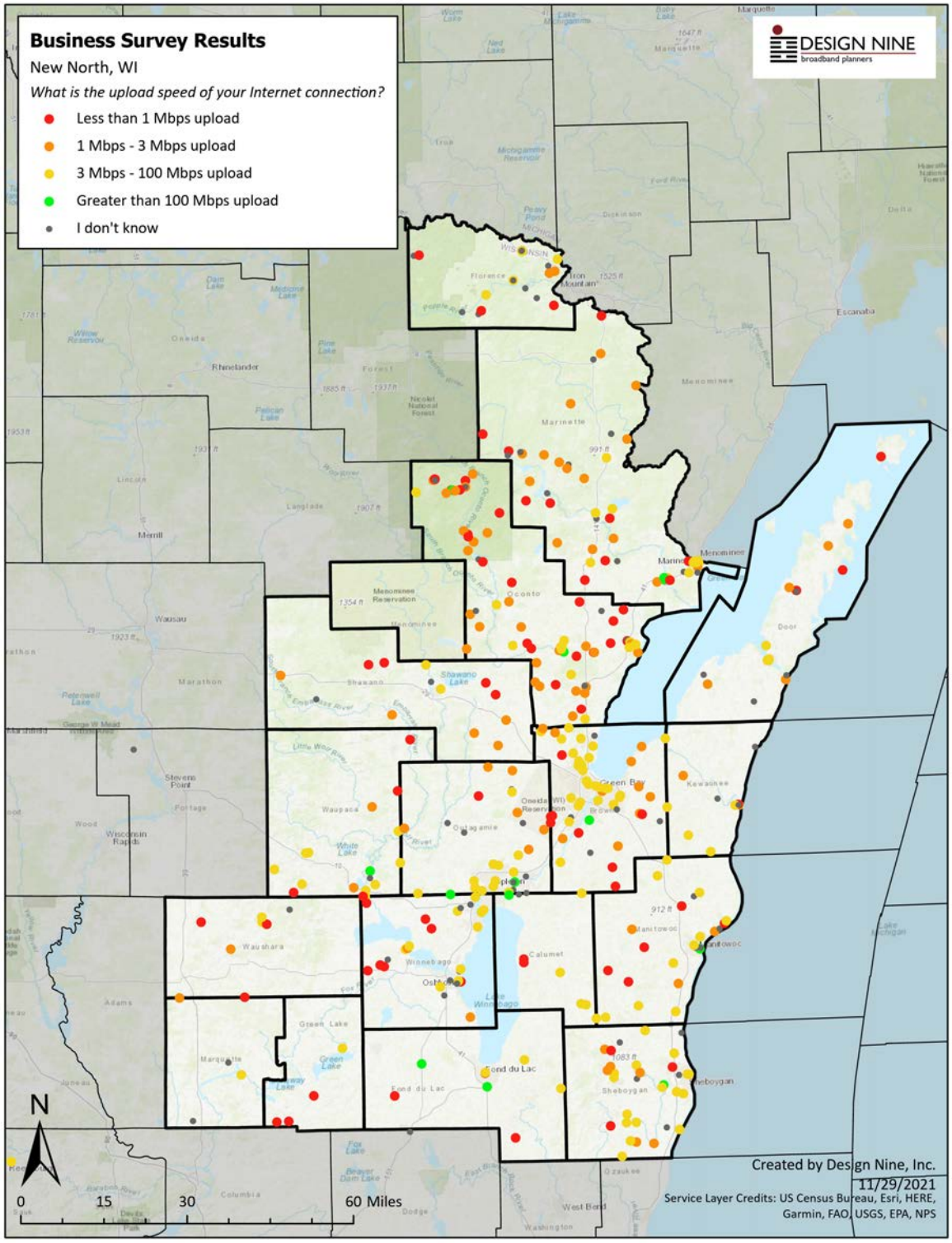
3.4 DISTRIBUTION OF BUSINESS SURVEY RESPONSES

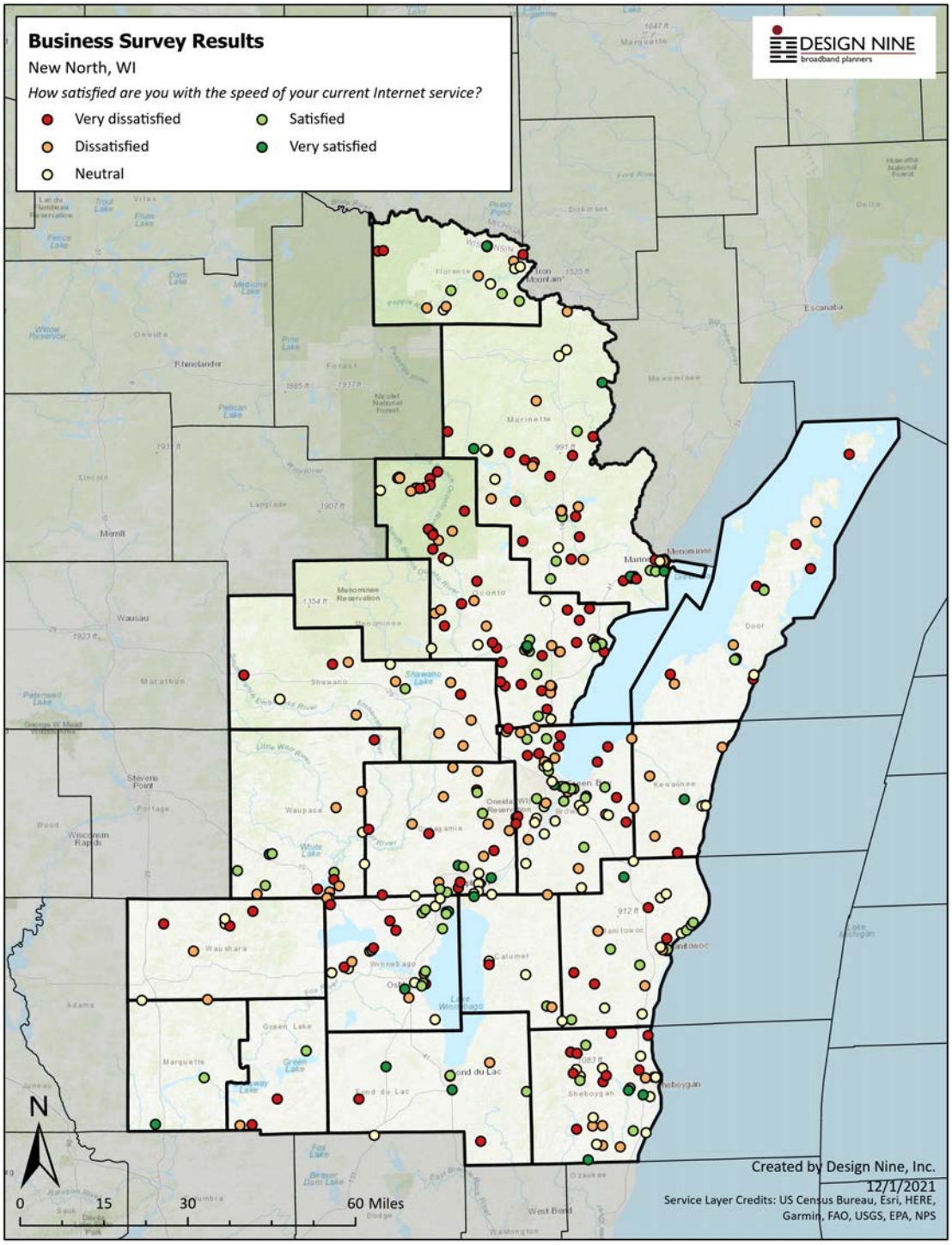
The maps on the following pages illustrate the responses from businesses to key questions on the survey:

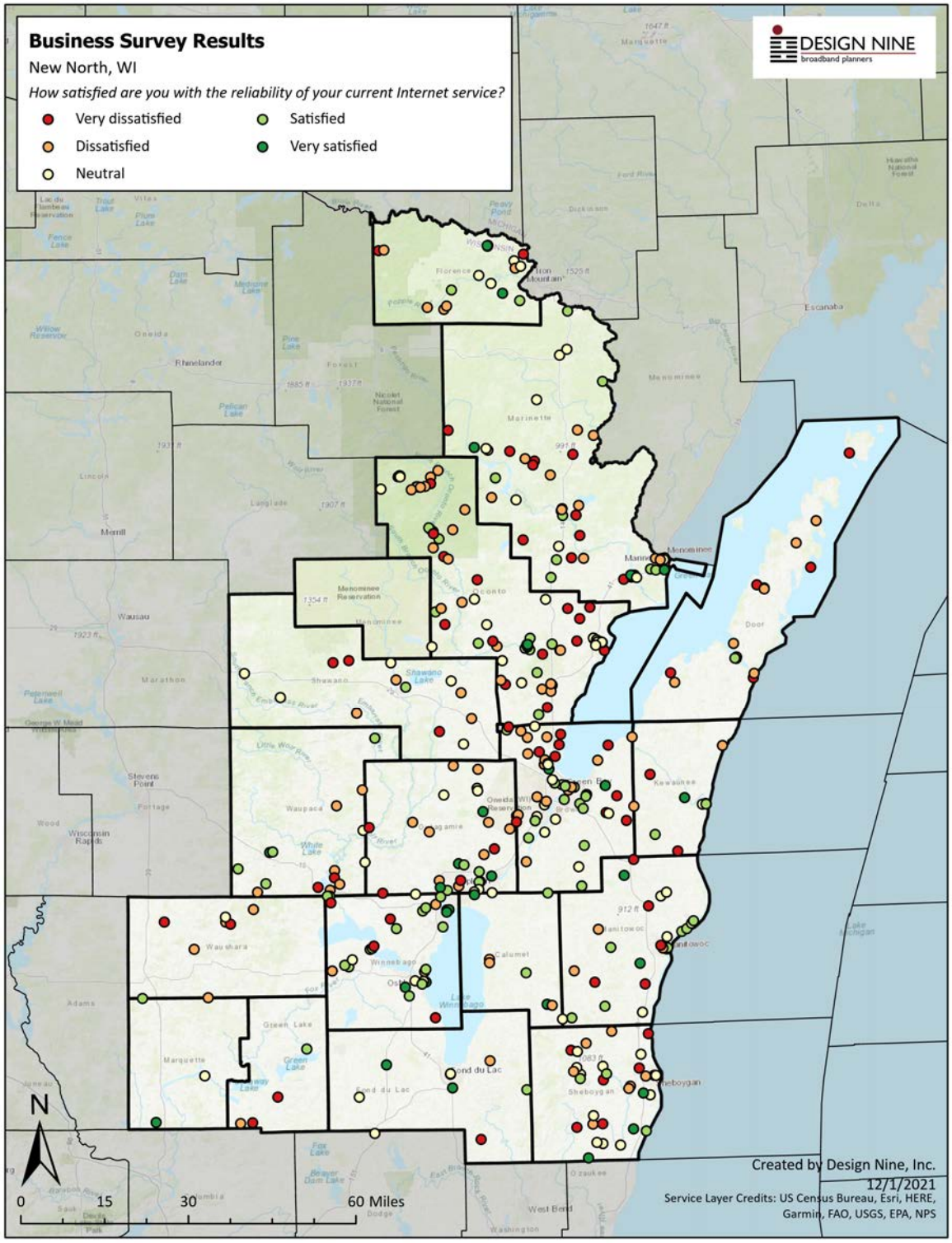
- The number of responses received from each county.
- The reported download speeds.
- The reported upload speeds.
- Satisfaction with current Internet speed.
- Satisfaction with the reliability of their Internet service.




Business Survey Results
New North, WI
What is the download speed of your Internet connection?
I don't know
less than 1 Mbps
1 - 10 Mbps
10 - 50 Mbps
50 - 100 Mbps
100 - 1,000 Mbps
1,000+ Mbps (Gigabit)
DESIGN NINE
broadband planners
N
0 15 30 60 Miles
Created by Design Nine, Inc.
11/29/2021
Service Layer Credits: US Census Bureau, Esri, HERE, Garmin, FAO, USGS, EPA, NPS


Business Survey Results
New North, WI
What is the upload speed of your Internet connection?
Less than 1 Mbps upload
1 Mbps - 3 Mbps upload
3 Mbps - 100 Mbps upload
Greater than 100 Mbps upload
I don't know
DESIGN NINE
broadband planners
N
0
15
30
60 Miles
Created by Design Nine, Inc.
11/29/2021
Service Layer Credits: US Census Bureau, Esri, HERE, Garmin, FAO, USGS, EPA, NPS

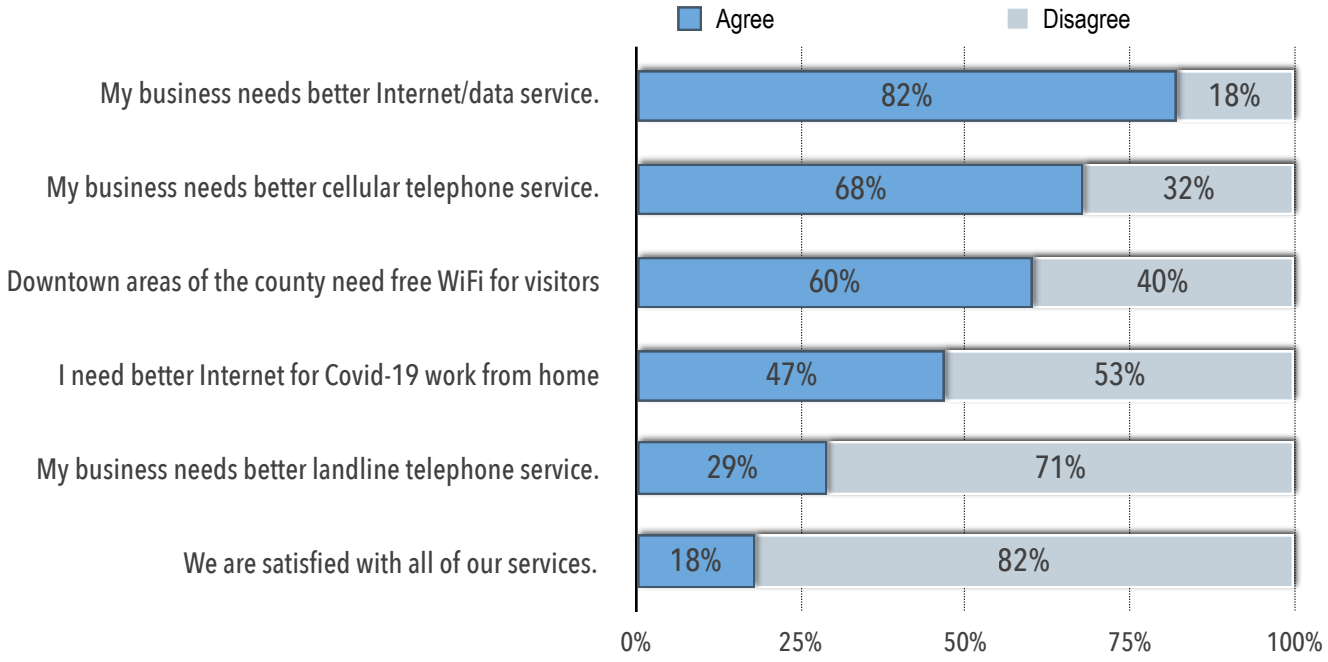

Business Survey Results
New North, WI
How satisfied are you with the speed of your current Internet service?
Very dissatisfied
Dissatisfied
Neutral
Satisfied
Very satisfied
DESIGN NINE
broadband planners
N
0
15
30
60 Miles
Created by Design Nine, Inc.
12/1/2021
Service Layer Credits: US Census Bureau, Esri, HERE, Garmin, FAO, USGS, EPA, NPS


Business Survey Results
New North, WI
How satisfied are you with the reliability of your current Internet service?
Very dissatisfied
Dissatisfied
Neutral
Satisfied
Very satisfied
DESIGN NINE
broadband planners
N
0
15
30
60 Miles
Created by Design Nine, Inc.
12/1/2021
Service Layer Credits: US Census Bureau, Esri, HERE, Garmin, FAO, USGS, EPA, NPS

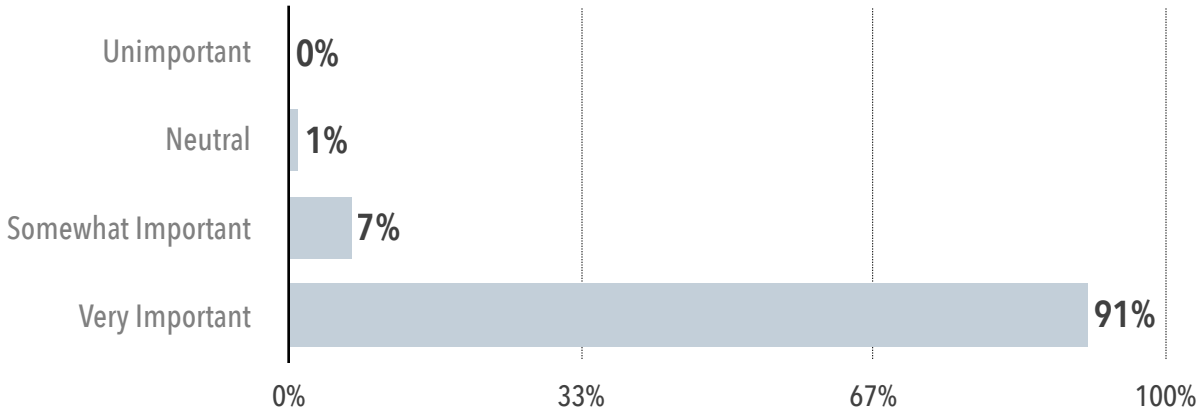
3.5 BUSINESS SURVEY SUMMARY DATA

1. Select the items you agree with below

A large number of businesses indicated that the downtown areas of the county could benefit from free WiFi for visitors and shoppers.



2. How important do you think Internet technology will be for the success of your business over the next five years?



3a. Total number of employees

1 to 10	71%
11 to 40	19%
41 to 80	4%
81 to 150	3%
Over 150	4%

3b. Total number of Internet users

1 to10	75%
11 to 40	15%
41 to 80	2%
81 to 150	2%
Over 150	6%

4. If you are a business, what type? (select all that apply)

Other	102	24%
Professional / Office	73	17%
Retail / Wholesale	57	13%
Agriculture/Forestry	45	11%
Construction / Maintenance/ Repair	45	11%
Manufacturing	38	9%
Non-Profit	28	7%
Medical	27	6%
Communications/Technology	25	6%
Government	24	6%
Restaurant/Food Service	21	5%
Educational	20	5%

Other types of businesses

- Consulting
- No longer working from home, two retirees reside at this address who use the internet and depend on reliable cell service.

- Industrial Paint and Powder Coating
- Financial Services
- Carpentry/ Real Estate Development
- Travel agency
- Commercial fishery with wholesale and retail fish store
- Vacation rentals
- Maple syrup producer
- Outdoor recreation
- Lodging
- Business & personal services
- Dog training/boarding kennel
- Gallery and ceramic studio serving retail customers and teaching ceramics classes to at least 10-15 people per week. we also have two rental units above the studio that used our internet service.
- Service
- Web BLOG (homesteading website)
- Financial institution
- Transportation/Trucking
- I run a technology-based management consulting business
- Service, sewing repairs
- Auto Body Collision Repair
- Auto glass & upholstery.
- Tourism
- Advertising
- Diesel mechanic service shop
- Retail Greenhouse
- Design and sales of process controls and instrumentation.
- Veterinarian
- Seasonal hospitality business. Cottage rentals
- Campground with cabins
- Boy Scout Camp
- Martial Arts
- Health and Wellness
- Vacation Rental
- Real Estate Co
- Insurance underwriter from home full time
- Financial/ Credit Union
- Vacation Rental
- Insurance
- Salon tasting lounge
- Real Estate
- Advertising/Marketing
- Insurance
- Registered nurse, not an option to work from home because my internet is so bad. My husband farms, cash crop, soybeans and corn
- Golf Course, Bar & Restaurant
- Martial arts

- Wind turbine company
- Automotive sales and service
- Hospitality conferences
- Pediatric Dental Office
- Property Rental
- Hotel. Hospitality
- Transportation
- Corporate Guardianship
- Tour and motorcoach operator
- Campground Guests
- Massage Therapy and Life Coaching
- Real Estate Appraisal
- Nutritional supplements
- OUTDOOR RECREATION MAINT. SUMMER, FALL, WINTER TRAILS
- Campground, Lodging
- Residential care for at-risk youth
- Transportation
- Historian and Author
- BEYOND ORGANIC, NUTRITIONAL, GI FOCUSED BIOLOGICAL HEALTH FOOD MFG.
- Lodging
- Online wholesaler
- Furniture dealer catering to the senior living sector
- Consulting
- Real Estate
- Consulting in Occupational Medicine - Design Build Mobile Medical Clinics and OSHA, MSHA, FRA and other mandated compliance software and medical instrumentation.
- Parish/church office
- Recreational
- Sheet Metal & HVAC contractor
- Dry cleaning, carpet and furniture cleaning, laundry
- Motel
- Maritime design and engineering with civilian and government contracts.
- BUSINESS TO BUSINESS SERVICES / FIRE EXTINGUISHER, SALES, INSPECTIONS AND REPAIRS
- Business Services (telephone answering service)
- Marina and boat service
- Dental office
- Portrait Photography
- Community Care Services
- Resort/Hotel
- Utility
- Automotive Quick Lube
- Work from home downloading large amounts of data.
- Work from home for a larger corporation but need better internet
- Service
- Commercial photography
- We are an electric cooperative and we also have a retail store as part of our portfolio.

- INTERMODAL TRUCKING
- Development/Rental
- REFUSE DISPOSAL/RECYCLE - A/K/A EVIROMENTAL SERVICES
- Automotive Repair
- Veterinary clinic
- Transportation Management - Brokerage, Contract Dispatch, DOT Compliance Services
- I'm also do office work for other businesses
- Plumbing
- Massage/Aesthetician
- Auction Business and On-line Antique stores
- A church.
- Traffic control for highway construction
- Tire Business
- Lawn care and snow removal
- Charter Fishing / Guide Service
- Well drilling
- Advertising/Promotional Products
- Hotel / Resort
- Convenience/gas station
- Church
- Hospitality/Lodging
- Financial
- Newspaper and Printing
- Real-estate
- Technical writing/consulting
- Dealer selling Pond Aeration products, assembly and install.
- Beauty Salon
- Lodging
- Vacation Business
- Fiber Artist
- Campground

5. Is this a home-based business?

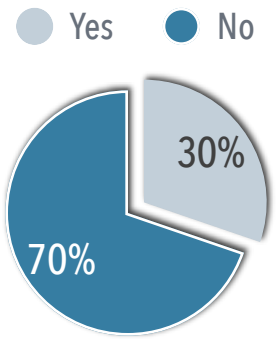
Yes	No
133	283
32%	68%

32% of the county businesses that responded are home-based

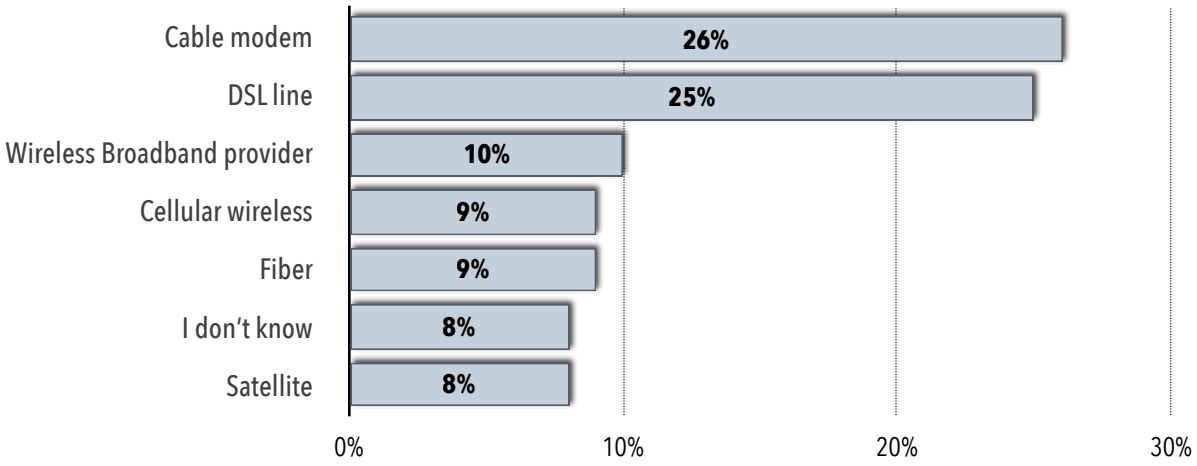
6. How much do you pay now for Internet access each month?

$0 to $100	$101 to $150	$151 to $500	$501 to $1,000	$1,001 to $5,000	$5,000 or more	I don't know
171	115	88	15	9	3	14
41%	28%	21%	4%	2%	1%	3%

7. Are you satisfied with what you pay for Internet service?

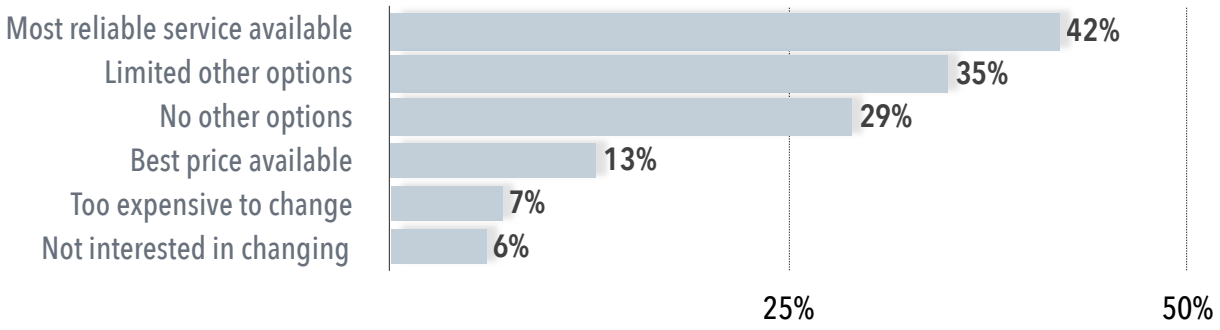


8. What type of Internet do you have?



9. Based on the type of Internet you selected above, why do you still have it?

Respondents could choose more than one option.



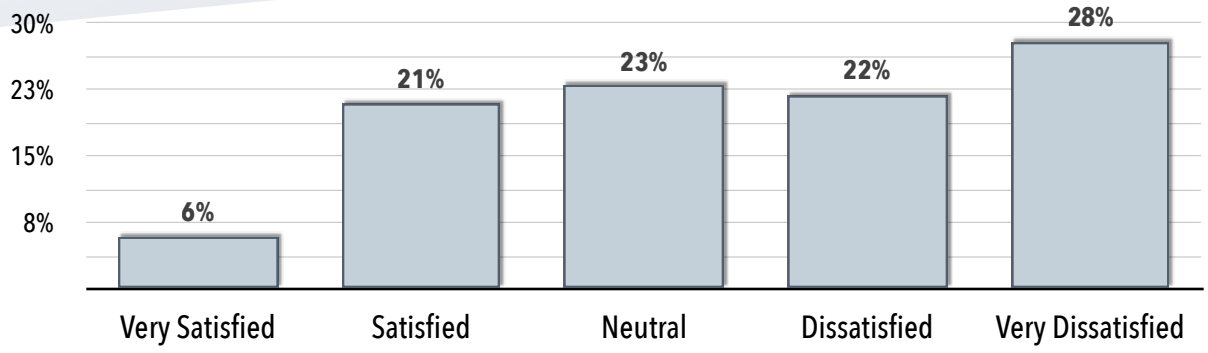
10. What is the download speed of your Internet connection? (A Gigabit is 1000 Megabits (Mbps)

Less than 1 Mbps	1-10 Mbps	10 - 50 Mbps	50-100 Mbps	100 - 1,000 Mbps	1,000+ Mbps (Gigabit)	I don't Know
23	108	93	53	57	4	73
6%	26%	23%	13%	14%	1%	18%

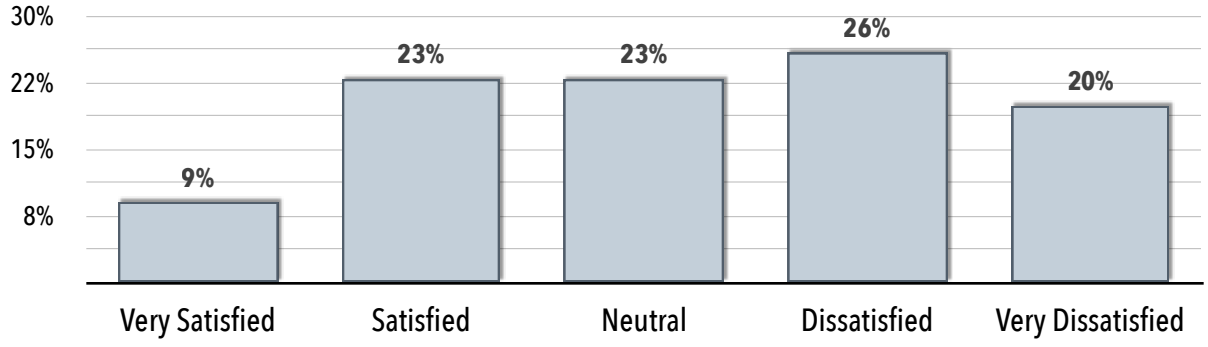
11. What is the upload speed of your Internet connection? (A Gigabit is 1000 Megabits (Mbps)

Less than 1 Mbps	1 - 3 Mbps	3 - 100 Mbps	100+ Mbps	I don't Know
83	94	143	13	77
20%	23%	35%	3%	19%

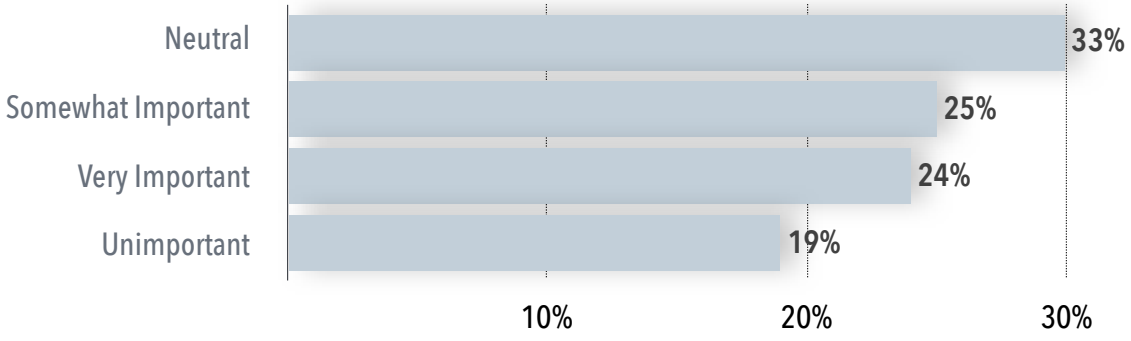
12. How Satisfied are you with the speed of your Internet service?



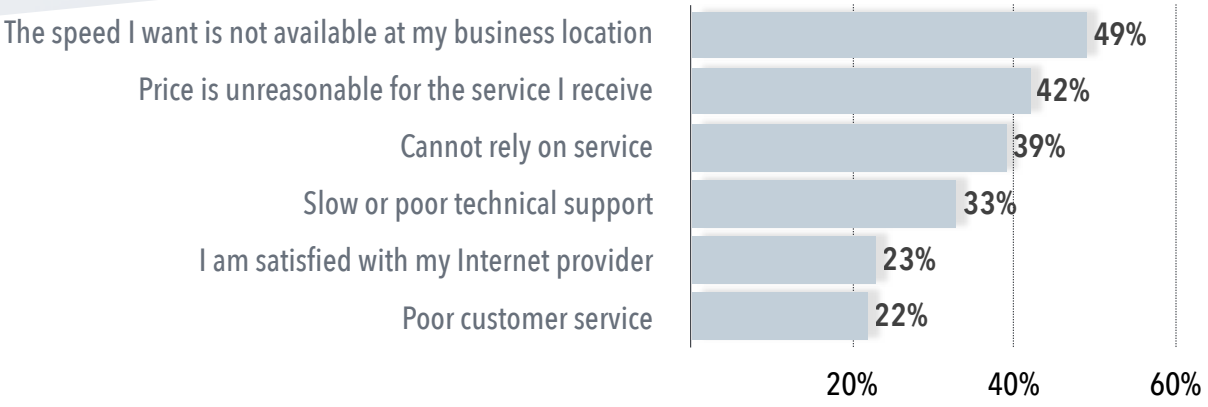
13. How Satisfied are you with the reliability of your Internet service?



14. How important is a redundant or second Internet connection to your business?



15. Please select all that apply to your current Internet provider



16. Select all the items you use the Internet for now(Select all that apply)

Social media (Facebook, LinkedIn, Twitter, etc.)	283	66%
Online Backup (files, photos, music)	280	66%
Ordering / managing inventory	246	58%
Monitor / control security, alarms, health, processes, etc.	217	51%
Processing credit card / debit card transactions	216	51%
Receiving and processing online orders	198	46%
Cloud-based business, accounting or other services	194	45%
VoIP Internet Phone(Vonage, Skype, etc.)	153	36%
Provide free WiFi service to customers	70	16%
Other	58	14%

Other uses for the Internet

- Security cameras
- Email
- Email, dropbox
- state and federal communications, elections
- Video conferencing
- Uploading video, home office. Business is entirely online. Spouse does some work from home also.

- SaaS for state sales tax calculation and shipping software. Soon we'll be looking at VoIP Internet phone service and online data backups.
- Research
- Educational purposes
- Wife uses it when she works for home for VPN Access
- Live video streaming
- Our guests use the internet while visiting us and staying in our lodging.
- Design collaboration with customers around the world.
- Providing customer proposals, quotes, and answers.
- Customers stream videos and TV shows
- Security cameras for business
- Corresponding with clients via email
- I use the internet at home for my business as it is to expensive to have it there and my business is very small
- Communication. Paying Bills
- General required business usage, taxes, DWD, Federal 941s, other tax requirements.
- Telehealth
- Would provide free wifi is our internet was reliable or could sustain it, but it is not and I was told by CenturyLink that it couldn't be possible for my location.....in town.
- Offer free WiFi for public use on school grounds
- Work from home because of reliability I purchase a MIFI service for backup when my dsl is not working. I previously had HughesNet which was too slow to even use for work at home. I don't have any other service available.
- Downloading audio files
- Guests are looking to work from the location and be looking for local activities.
- Zoom for business
- Checking agricultural prices. Most things I don't even try because it is so poor
- Online tax collection program and online State Voter Registration system
- Working from home.
- Day to day operations of business.
- Banking, trainings, continuing education, research
- Emails, accessing necessary government applications
- Online Life Coaching
- Government reporting.
- Education
- Personal use as in web search, online banking and buying.
- Streaming
- Viewing / showing video (live pre-recorded)
- On-line Research
- Downloading technical manuals, online customer meetings
- My whole point of sale system (cash register) is internet based.
- Email, internet access, research
- ALL KINDS OF STUFF COMPANIES PUT ME THRU !
- IT remote hardware/software support
- Ministry site
- VPN
- VPN
- Email, quickbooks, google searches

- Emails and downloading or uploading plans
- Job shop online ERP system.
- Audio streaming
- Sending & receiving drawings to/from other engineers, architects, vendors and contractors. Sending & receiving information for equipment to be installed on projects. Sending drawings & specifications to the state for approval. Receiving approved drawings & specifications from state.
- Receiving/sending emails, sending invoices, banking for our business.
- Using clearinghouses for billing
- We just upgraded our Internet speed a month ago.
- Stream music
- Broadcast of our worship services, uploading and downloading resources, Zoom meetings
- Technical videos, Educational Videos, Governmental conferences and meetings.
- I am a virtual school teacher for the Manitowoc Public School District teaching from home. I use Google Classroom all day long.
- Research, on-line banking would like to stream content and webinars, Webex & Zoom
- Research, online IDEs such as Google Colab, dataset downloads, and book editing/transferal
- VPN
- There needs to be an other internet provider than Spectrum in the area. They charge an unreasonable fee because they can due to no competition.
- Web development

17. Who is your Internet Service provider?

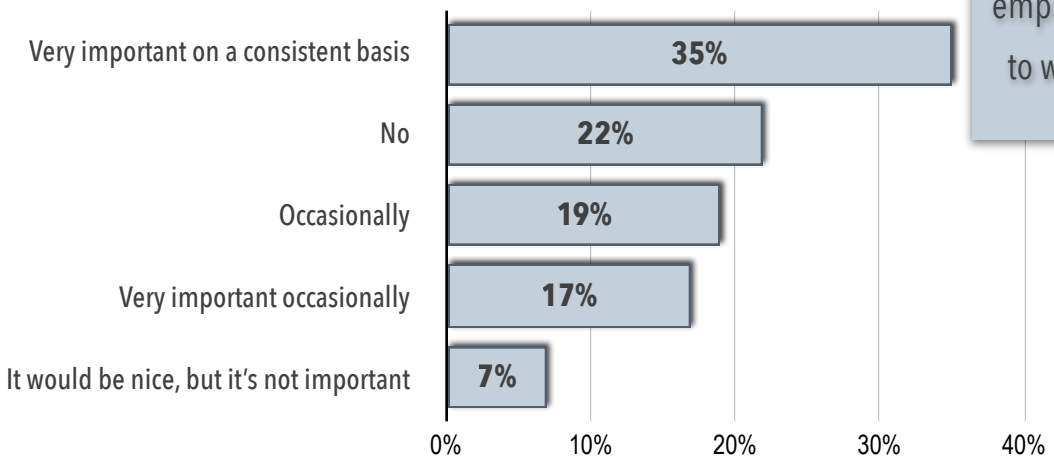
Spectrum	129	34%
CenturyLink	80	21%
AT&T	29	8%
Nsight	24	6%
Satellite Internet	14	4%
Bertram	14	4%
TDS	12	3%
Frontier	12	3%
US Cellular	10	3%
Astrea	9	2%
CellComm	8	2%
Verizon	8	2%
Cellphone Hotspot	7	2%
Star Comm	5	1%
Wireless Internet	3	1%
Bug Tussel	3	1%
Comcast	2	1%
Airstream	1	0%
Door City Broadband	1	0%
Cirrinity	1	0%
Waupaca Online	1	0%
WiscNet	1	0%

18. What kind of telephone service do you have?

19. Do you or your employees use a VPN (Virtual Private Network) to obtain remote access for your work or to a company network?

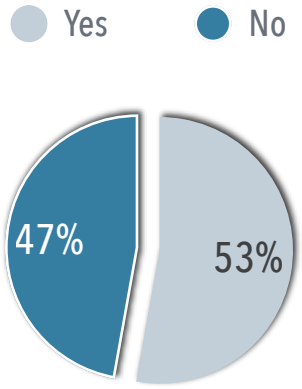
Yes	No	I Don't Know
146	233	35
35%	56%	8%

20. Do you or your employees need or want to work from home?

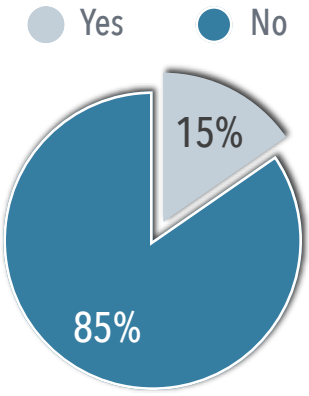


71% of businesses that responded need employees to be able to work from home

21. Does limited Internet access at employees' residences impact your business?



22. Do the existing internet service options impact your business's decision to relocate or stay in the County?



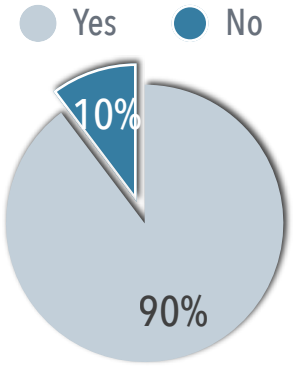
If yes, briefly state why:

- It could come to that.
- No Fiber Gigabit soon and I will be forced to relocate, potentially out of state
- We have no other options. No customer service. We are trying to get someone to pull us a line and help us but no one has any options. CenturyLink gets to charge us whatever they want.
- In order to complete my work I have to rent an office in Green Bay rather than work from Home Office.
- We need world-class speeds and reliability. We do not have it. For example: no fiber availability 'last mile' in Kewaunee.
- The business commonsensehome.com is entirely web based. Internet isn't an option. That is why we have 3 services. We are also on the waiting list for StarLink.
- I need the internet to operate my business as it is based upon collaboration amongst numerous individuals/companies throughout the midwest. If I don't have internet access, I don't have the latest information.
- There is no choice but to stay where we are.
- The satellite internet service we have through ViaSat has too much delay. Latency. No matter how fast, it's close to useless.
- No other options

- Both my wife and I work from home and we would love to sell the house and move to the cottage but can not because we can not get internet to support both our business.
- The location of our business is critical to our success but if I had the option of moving it to another location with better internet I would do it.
- My work is mainly remote and I need to receive large files and send large files. If I can't get them in or out in time I loose business.
- You can't move a greenhouse business.
- My students parents use mobile data while waiting for students in class.
- If the internet gets worse, I will be forced to leave for internet access as I work from home
- We're a community health center. Our focus is on serving patients with an approach to community based health regardless of status or income.
- We want to move up north but my husband relies on having access to high speed internet and or can't work from there and move there until we know we have reliable service. We are considering century link at this time.
- We may have to rent an off site building to expand our business. We are just finishing up some education while developing the business plan
- WI if we cannot figure reliable internet for affordable pricing we will have to move.
- For work from home, the homes with internet available are extremely limited in the area
- The availability of internet effects people decision to stay in a location or not.
- I would like to work from home but I can't with the internet we have.
- We are a dairy farm and currently looking to find our forever farm, as currently we are leasing. One of the biggest deciding factors is that we cannot make a call on our farm for business purposes, as calls constantly drop. Although we do not have a landline, we use WiFi calling to complete all the calls for the farm, due to us not ever being in one place at a time throughout the day. So we rely very heavily on our internet connection. Our internet connection routinely cuts out throughout the day which makes calling difficult as well as keeping track of our herd, as we use a device on each cow that tracks their health. We are hoping to see an improvement soon in the internet or it could impact our decision and we may purchase elsewhere.
- We currently have three business locations. It would be nice to expand my rural village office in Wittenberg, however lack of fiber internet of at least 100 mbps can actually corrupt the software systems so I currently do not access internet at the Wittenberg office except for my cell phone which I use to process credit card transactions, communicate via email and process credit card transactions. There is no internet service available at this time that I can use to run our online accounting programs without risk of major data corruption. I called Wittenberg Telephone and they are expanding fiber access in the countryside using grants but it appears there are no grants available to encourage expansion directly within the village limits so at this time it is unknown when they will focus on converting to fiber within the village.
- Due to Covid and the over inflated rising costs of real estate, I am unable to relocate my residence/office to a location with better internet.
- We are exploring moving our office positions to a new location due to the inability of the ISP to provide consistent service.
- We may be forced to relocate more services if internet continues to be unreliable.

- Purchased my location because of limited internet speed available
- It's a must to have adequate internet speed to perform my work from home.
- I must have access to function. We just bought another house, in a large part because the internet service here is deficient.
- As a regional EDO, we do not have the option to relocate out of the county. We are asked to report to site selectors on availability and type of internet services in our region.
- we often talk about relocating, but still have hope that soon we will have reliable service.
- We are in the northeast New London industrial park. One side of the business park has high-speed internet, the other has nothing. Called the city repeatedly to discuss the plans for providing the entire industrial park with high-speed internet. Never got a returned call. Was quoted $3K per month for a minimum commitment of three years by AT&T to bring in high-speed fiber internet to our location. Our customers virtually check-out their products online prior to shipping. We can't accommodate that need. We will be forced to relocate.
- We are in Neenah. Internet is fine for basic web stuff and email.
- Municipality and not going anywhere
- I have considered relocating north of Green Bay to our cabin someday. However, the internet service is less reliable there. I can't relocate to an area with less reliable internet service, so I have to stay here at least for now.
- I'm getting to a point where i may need to find a new job because my internet can't keep up with the data needs.
- I need internet access to do my work.
- This service is a joke
- Have too much invested to consider relocating.
- I am a Realtor and handle paperwork and research on line. I need to access and communicate information quickly and reliably. My residence is too remote to get a signal for antennae and I'm using the only available option which is poor quality and slow.
- We are so close to surrounding areas who all have AT&T and Spectrum available. We have no options
- Since we are a church in the same location for 160 years, relocation isn't an option.
- Since we are government we have to stay in the County
- No other options
- We are going to move to an area that has fast, cheap, fiber and good cellular coverage
- Century link is basically a cartel up here in Suring. They spend a lot of time kicking people off. It's sad because there's a physical hub in Suring and really no excuse for the connection games they play. I'll be in class and the internet will just reset itself for no reason that their tech people can find. Century link also throttles people who are gaming or streaming.

23. Are you interested in fiber delivered Internet Service?



24. Should New North and/or your county government facilitate better broadband services and more affordable services?

Yes	No
391	22
95%	5%

25. Any Other Comments

- It is very difficult to run our business with poor at best internet, archaic land lines that go down monthly and poor cell phone service. It would be greatly appreciated anything you can help us with.
- Reliable, Zero Lag, Gigabit Internet is a must in a post Covid world to conduct business and stay competitive and functioning
- My internet signal drops in and out quite often. I use a remote back up service for storing all the information in my main business computer. Because the internet signal drops, the back ups often don't complete reliably. Spectrum's email service is 'horrible.'
- In today's digital economy our local government is doing its citizens a disservice by avoiding investment in faster, secure internet connections. There is almost no part of modern life that is not touched in some way by the internet. Additionally, CenturyLink charges $45 for 3 mps or $15

per mps but if you are in Green Bay you can have Spectrum for $55 with speeds that are around 200 mps or $0.28 per mps. Clearly folks around the Town of Scott are getting a raw deal.

- My answer to #24 is truly yes and no. I don't believe the broad availability should solely rest on government. The private sector needs involvement, however it may and probably will need to be a coordinated effort between the public and private sector to reach all county residents. Our company battled with reliability and speed for many years. I tried multiple different providers from satellite to wireless, but our location never provided the necessary speeds. With the growth of the company and our increasing demand for speed I evaluated a fiber installation from a couple providers and we made the decision to bring fiber to our location back in 2019. There was a significant upfront/installation cost, along with what I feel is a costly monthly feel. Though we no longer had the choice and option to stay with our prior service.
- Question 18 has a flaw: We have VOIP phone service (five lines). That is neither land line (interpreted to mean traditional twisted pair) nor mobile.
- The FCC says we have high speed available on the maps. We called ALL nearby providers - NONE provide anything better than 3 to 5mb down and .5-1mb up. That is why we ended up getting multiple alternatives. None are above 25mbps. The FCC census block data is garbage. Also the WI-PSC data shows multiple landline internet providers. In reality we only have 1. The data is flawed. We believe there is fiber from at least 2 other providers less than 1mile from the house but none would consider a lateral even if we paid $20k to hook up. Internet access isn't an option any more, it is functionally as much a utility as water, sewer and roads. This needs to get resolved.
- I understand our township of Carlton has received monies from the American rescue plan, however, it appears it is not going toward better Internet service in my area. Their town meeting minutes are not available online. Only their agenda. Trying to get any “specific” answers from Bug Tussel or discussion of Bug Tussel in the Carlton area seems impossible. In addition I was told TDS Telecomm received federal monies to help Rural internet but I found out there is no plan to lay any fiber cables in my area. Why??
- We are willing to help the community however there doesn't seem to be any interested providers in the area.
- Fast, reliable, and affordable internet is essential for both business & personal use. We have very limited options with spotty performance currently.
- None
- We have fiber close through CenturyLink. But not here. They are offering 3mb download which we are going to try but that is close to dial up speed we had in the 90s. Hard to believe we are 2021 and still have this problem. I have no problem paying the money but expect service
- As the owner I have lived here the majority of my life. So frustrated with the over prices monopoly Spectrum has in this area. Century Link tries to work in the outlying areas but it is so slow that when my employees try to work from home the internet connections available to them was no where near adequate to do teleconferencing for meetings with staff or clients. This impacted out businesses bottom dollar and almost put us out of business when we were quarantined last year for COVID. Working as a mental health provider the internet speed affects a lot of our clients as well trying to connect when they are ill. Please bring in other companies that can be more cost effective and deliver Fiberoptic opportunities.

- We have tried to get the best internet possible for our business. All of our on-site transactions as well as our phone transactions occur in the cloud. We also rely on VOIP for our phone system between our two locations. Last year we were able to get DSL but only at speeds of up to 6MB. We have been forced to pay for a T1 line as our only option prior to that. We still pay for the T1 line because the DSL is unreliable. Even the T1 service goes out just about every time there is a storm. The T1 service is supposed to be a very slow 1.5MB up and down but often times is slowed down to a crawl with our traffic. We have the T1 service for our office, we use the DSL service for our guests which is very inadequate, and we have a Verizon hot spot as a backup to those for our office. However, Verizon has become almost unusable on busy summer weekends due to the increased area traffic. All together we spend approximately $700/month for very subpar internet. We are currently waiting to try the Starlink option but we've been disappointed by satellite internet in the past. As a business we are severely handicapped by the internet availability in our immediate area.
- biggest issue we see is many of our employees do not have adequate internet at their home to do online classes or testing to improve their skill set.
- Using Facebook marketing and Credit card processing are the main problems, also temperature monitoring equipment relies on internet.
- Don't have any broadband options for Internet service.
- Our business is one mile from down town Montello and we are not able to get internet to our business.
- Fiber sounds great. No 5G!!!!!!! Then we will be forced to move to another county for health reasons.
- CenturyLink is consistently inconsistent. Starlink sounds like it works well for everyone that has it but long wait list and high startup cost. Something in the $60/mo range would be great!
- We are currently on 5g wireless. We would tentatively switch to a new ISP if it is fiber to the house.
- Please help us in this area to come up to speed on this matter.
- CenturyLink has the ability to provide internet speeds of over 50mbps but they restrict users.
- The internet service in the NE Wisconsin is an absolute joke. While we have fiber optic (1 Gbps bi directional) at our primary clinic location, our secondary administrative site less than 1000 feet away cannot get anything better than a DSL connection which is approximately only 5 times faster than dial-up was 15 years ago. CenturyLink (Now Lumen) has a monopoly on this area and other WISPs have tower based internet services that are over capacity and they're gouging the consumer. For as much money that is available for grants for building infrastructure, there is a severe lack of options or any development in our area. The topography of the Lakewood area provides challenge, however, technology exists to bring decent modern speeds to our area.
- The internet in this area impacts businesses of all sizes because people need fast internet to live here full time and a holiday weekend you can't even make calls or send texts/emails. Having to inventory and order products has to be done in the middle of the night during the day it's impossible to submit. This area is extremely be hind the times in service
- We would love for broadband internet service to go through so that we could work from home..

- Internet quality and reliability in town is horrendous. Customer service is a joke. Some of our customers who live in the middle of no where receive sometimes triple the speed we can and their internet is more reliable.
- The lack of access in our area to reliable internet is a problem for students and families. It is inequitable and it leads to families not wanting to remain in our area despite them wanting to live in a more rural area. The internet-related amenities are significantly better a few miles south of our school district.
- Lack of upload speed makes it impossible to stream services
- My home location internet is my main issue. I have not been able to get decent internet there since I built it so working from home is not an option.
- My husband had an office work from Home job and had to find another job. He is currently is school to learn a new trade and then we would like to start our own business but with internet options may have to locate the business elsewhere.
- This is an ongoing issue in this area and I do not know how Oconto county has not done something about this sooner!
- Would be a game changer!
- There is little to no service there now.
- Honestly we also need more cell towers in the area. It is a dead zone by my house. Everything in our house is hooked up to the WiFi just to have some functionality.
- We hope to see a better internet option for rural businesses like ours in the future. Thank you!
- Internet service is pathetic and unreliable. People in big cities don't understand we have no other options here
- We need unmetered fiber to the premises, with symmetrical speeds with an ISP that upholds net neutrality. If anyone suggests doing less than that, ignore them. I'm tired of this area having terrible choices.
- We are limited in our ability to contribute to society due to such poor internet
- Our internet and phone service is really poor and affects our business negatively on a daily basis. Higher speeds and more reliable service are much needed. Please help!!
- Many areas the broadband maps indicate it is available are misleading because although there may be access, the access is unreliable, limited during times of peak use and there are dead zones that are not shown by the maps. For example, I live in downtown Clintonville, I can see the cell tower from my house but at least two nights per week, I have no cell coverage because of the volume of use at the time on the tower. Lack of reliable high speed internet access is going to be a major driver in where businesses locate and where people ultimately end up settling. Counties, towns and municipalities who don't have access are going to die economically.
- I am really disappointed in the cellular service provided in Shawano and surrounding areas. I live in Cecil and have line of sight to the tower, but my signal at my home, my way home, and at the restaurant in Shawano are very poor. I usually have to use wifi calling at home and inside the building in Shawano I have little to no service. I'm not sure why it seems, I had better service decades ago than currently?
- Internet availability in this area is none to one. My neighbors have no options at all & have students still in school which forced them to go elsewhere when school was shut down last

school year. Fortunately, I am higher up on a hill than they are so have only one internet option available to me. A couple years ago, it was sporadic & had to cut down a large tree cause it was in our line of sight. Fortunately the neighbor allowed us to cut his tree down so our internet service could continue. Previous provider had to be cancelled cause trees between my house & the tower grew up too tall which prevented our line of sight. Bought us a couple years by moving our receiver up on top of house on the chimney. Anyways, one of the downfalls of living out in the country i guess. My current speed is not fast enough for security cameras or allow streaming on TV for multiple TVs which is disappointing. This area is in need of faster/better options, any options for some in this area. Cannot get to this area fast enough!

- The internet service through Spectrum is terrible, very unreliable and the customer service is horrible and slow to get. Spectrum is only option in my area and other faster service is just too expensive. Spectrum needs to improve their service asap. now please.
- High speed (at least 200 Mbps) broadband should be free for all residents and extremely cheap (subsidized) for businesses that need super high speeds or large bandwidth. Internet access is a utility and should be treated as one. Run them as nonprofits and pay for them with a sales tax. Whatever gets us closer to that is what you should do. It will be a game changer for businesses, education, etc.
- Lack of adequate service in rural areas of our county and in specific urban locations is an ongoing problem. Also not having competition from multiple providers in most areas is a problem. Pricing and service choices are not fair when there is a monopoly supplier. Internet has matured to the point where it must be considered an essential utility. This requires some level of government oversight or regulation in combination with fostering private enterprise. Content should not be throttled when minority opinions are expressed. Federal money currently being provided is supposed to encourage having multiple providers to the end user / end mile. This goal is not occurring in spending of public money to improve broadband service.
- Government is NOT the answer. It will be over budget and not fast enough to respond to whatever the next, unknown at this time, technology is going to be. This is NOT a good idea.
- Self employed electrical engineer/programmer, working from a home office, semi-retired. I responded to the residential survey too, at this same address. We need a competitor for Spectrum. They are an abusive monopoly.
- I would be interested in possibly contracting to be a tower location at my rural property.
- We are a different kind of business, our ski club members that live in the Lakewood area do not have adequate internet service from their homes so when we have a virtual club meeting our members have to drive to the local library or city building to get wifi service. Our club members don't have internet or cell server on various parts of the trail which makes it very difficult to locate someone who may get lost or injured on the trail. (This has happened) We would like to offer GPS service on our trail but again we don't have reliable internet service.
- Lived in the country for many years and internet was horribly slow. Outlying areas need a lot of improvement.
- You're too late!
- Federal, State, County nor City government has any business in broadband, cable, phone administration or provision.

- I don't see what government has to do with any of it. We have had offers from many satellite internet providers and none of them function satisfactorily. The cost for fiber optic is ridiculous.
- Spectrum sucks
- what we have now is adequate but with IoT coming on we will need better.
- We need more options, leading to competition between comparable and reliable providers.
- We are extremely dependent on internet service for voice and audio. Nsight is great but i would like as close to gigabit bandwidth up and down and they are expensive at that bandwidth. We have coax internet service from Spectrum and they are not reliable enough. 99.999 means . We might be able to get better reliability from Spectrum but would need to have fiber to our building and sign a long term contract. With internet charges gradually decreasing or bandwidth increasing without a price increase i don't want to sign a long term contract with Spectrum. Their reliability is far from 99.999% up time over the period of a year. We could sure use gigabit service at a reasonable price.
- In town my internet is fine.
- Our main problem is experiencing random service outages or slow speeds during the work day. Our secondary problem is trouble accessing Netflix. Sometimes everything seems just fine, but annoying problems arise too often.
- I don't own a business, but i work from home and need better internet. My neighbors also need better internet. There are teachers, students, pastors and other work from home individuals. I know a few more people who would like to work from home if they had an option. Many use CenturyLink with speeds of 1.5 mpbs and are charged $50+tax a month. Others use cell phone hotspots... but they are unreliable when it storms. Some have tried satellite, but it doesn't work in our area. Bertram won't service our area due to trees. Many of us are waiting for Starlink, but who knows when that will be available or if it will work. People are moving into our area and reliable high speed internet would be great!
- Many of our neighbors need better internet. We work from home, are teachers, pastors, kids trying to do school work. Etc. Our current options. Cell hots spots are un reliable when it storms or there are people headed up to their cabins. CenturyLink charges way too much for the speeds they offer. Satellite doesn't work in our area. Bertram won't service due to trees. The better services are to the west of highway141.... but we keep getting forgotten on the east side of 141.
- i don't really know who new north is and don't really think it should have anything to do with my county government as i don't believe my internet needs are any of their business.
- Very interested in fiber, but pricing was unreasonable for small business size given the other support services we have to employ above and beyond the service coming into the building.
- While we are satisfied with our current internet provider, I selected YES for both 23 and 24 because we do think it is critical that fiber is available in this area and that New North and our county government should be involved in the process of facilitating better and affordable broadband.
- More effort needs to be put into cellphone service. Our cell phone service is not very good and I require cell service. My cell provider is Verizon.
- Spectrum is right now the road - less than 1/2 mile and they want $25,000 to bring it to us. Not gonna happen on our part but we need faster internet to run our next upgrade to our ERP system.

- I, at least, have service. I have friends in the area who still cannot even get it.
- WE TRYED SATELLITE AND CELLULAR WHICH BOTH WERE TOLERABLE AT BEST. WE SWITCHED TO BUG TUSSEL TWO MONTHS AGO THE WEEK IT BECAME AVAILABLE. TO DATE IT IS NOT AS GOOD AS THE INTERNET WE HAVE IN TOWN BUT IT IS DARN CLOSE.
- We double up our internet between our cell company and star comm because we need it to order parts and run transactions for our business. no internet equals no customers...
- We live 200 yards off a major highway and can't get fiber service.
- We really need to get our technology beyond 1990 levels. I miss HUNDREDS of opportunities each week due to slow, unreliable internet. If I could capture some of those opportunities, I could justify adding employees.
- There are things my family and our businesses cannot do simply because we have no internet access to be able to do it.
- thank you for doing this. It is very important to Wisconsin property values and ability to do business.
- RELIABLE and affordable internet access are vital to the future of Northeast Wisconsin. Whether it is business operations, health care delivery, or education, it should be considered an essential infrastructure. This is especially true in rural areas which are at a distinct disadvantage given the population densities. It's time we work on solutions.
- This is a very important area for my business moving forward. There are so many better options in the bigger cities that we just don't have access to out here in the country. I am very optimistic that we can improve this situation with some more reliable options!
- Fiber is an absolute necessity at a reasonable price.
- Please Hurry /Soon!
- Most all our business needs are accomplished on the internet. We live 20 miles from personal and business shopping so we order most everything on the internet. Our son is running his business, Warrior Welding, using our outbuildings and he, too, almost exclusively uses the internet to reach customers, contact customers, order materials, and notify when work has been completed.
- We have cable and fiber available less than a mile away in each direction, but none of the branches get to my residence. The only 'high-speed' option we have is cellular based, with StarLink allowing a deposit to get on the waiting list. The cellular service has either been slow, or incredibly unreliable...sometimes both.
- Would like nonprofit organizations to be able to use the same subsidized Internet services that local government agencies use, the price and value is much more affordable and sustainable over time. However the one-time cost to retrofit/make the conversion to be able to access the government Internet service is prohibitive, so it would be ideal if grants could be offered to nonprofits.
- Hughesnet and century link are the only options in our area. We have tried both. Both are TERRIBLE and are very expensive for super slow internet. Both companies customer service/tech support are terrible. Top frustration of having a business in this location.
- CenturyLink and Cellcom get the job done when the area is quiet, but as tourists flood in on weekends and summers, we deal with no service from Cellcom and CenturyLink went down 3x this summer. Our area can not handle the influx of traffic which is what we survive on as a

business. Our personal residence runs off Bertram, but this is not an option for a lot of people because of wooded areas. CenturyLink says they are full and can not take on any new customers. We need another viable option for people and businesses to stay in this area.

- Internet is communication medium now. More than phone, lines, fax numbers, paper mail, etc. Good internet is vital to maintain contact with customers, to promote our business, to update technology in our office, for security, to keep in contact with our coworkers, to connect to our office laptops when we are away.
- As a school district we received discounted rates for our Internet service. In our buildings, our service is great. However, for students, families, or staff who need to complete school work or work from home it is extremely challenging to have any type of reliable service for up to 20% of our families. This divide increases the learning gaps as when these students are absent they can't keep up with homework or log into virtual classrooms.
- *We cannot do online back-up of our data because of the slow internet speeds *We cannot fill out tax forms or other government reports at the Town Hall because the internet is too slow - so this work has to be done from home, when it should be done at the hall. *We cannot use newer technology for registering voters on election day because of slow internet *We cannot offer residents the ability to attend a town meeting via zoom because of the slow internet *Little River is lots of farm, which rely on technology more and more to do their work, so faster internet would benefit them *We also have more people working or doing school from home- like many other places- and they need reliable and reasonably priced internet to keep their jobs. Thank you!
- Most importantly we need better cellular phone service!!
- no other options
- Nsight has fast broadband, but it ends a couple of miles from us. CenturyLink owns our lines and id responsible for our service and ran fiber but ended it to far from us. We're on the end of their line and they didn't even run it to us.
- Some answers were a little difficult to answer honestly because of the way they're worded. I'm a one person company most of the time, so I already work at home full time and I already have a fiber connection.
- Don't know enough about it to answer correctly
- I have fiber that runs right past the business but no service outside of satellite that comes close to speed i need.
- We can only hope. Astrea is much more expensive than CenturyLink for a mere 10 megabits more. They also won't lock in any decent prices without a tv bundle.
- All business's and homes should be able to have access to fiber at a reasonable cost.

4 TECHNOLOGY SOLUTIONS

4.1 OVERVIEW OF THE TECHNOLOGY

In the New North region, both fiber and broadband wireless infrastructure improvements will be an important strategy for better Internet access for businesses and residents. The table below summarizes how fiber and wireless can work together in a variety of ways.

Distribution Type	Access Type	Capacity
Wireless	Wireless	Typical customer connection starting at 5 to 10 Megabits, can be higher, with 50 Meg connections common. More dependent on the capacity of the wireless Distribution link.
Wireless	Fiber	Users can have fiber Gigabit connections locally, but total throughput dependent upon the capacity of the wireless link, which can be up to a Gigabit, depending on distance and budget.
Fiber	Fiber	Any amount of bandwidth needed, with standard connection typically a Gigabit (1,000 Megabits).
Fiber	Wireless	Typical customer connection starting at 5 to 10 Megabits, can be higher, with 50 Meg connections common.
Fiber	Coax, DSL	Providers can use a fiber middle mile backbone and distribute improved broadband Internet services using copper-based coax (cable Internet) or DSL (copper phone lines).

Businesses and residents may obtain Internet service in a variety of ways:

- With a fiber connection to the fiber installed in areas where economic development is important, and in other areas as additional fiber network segments are added.
- With a fiber connection to home or business, with distribution fiber connected to a nearby wireless tower, with Internet backhaul provided by a high performance microwave link.
- With a small radio directly attached to their home or business that receives a signal directly from a fixed point wireless tower.
- With a small radio attached to a utility pole (60 or 70') to improve line of sight to a nearby taller fixed point wireless tower.
- With a DSL or coax (cable modem) connection to the home or business, with Internet backhaul provided by fiber.
- With a small radio directly attached to their home or business that receives a signal from a "community" utility pole. The "community" pole will receive a signal from a distant tower and redistribute it locally to a cluster of customers (typically within a half mile).

Both fiber and wireless technologies and systems are going to be important to meet the goal of improving access to broadband. The rest of this section provides more detail and some specific build out strategies.

4.2 DARK FIBER AND LIT FIBER

About Dark Fiber

Dark fiber is installed in conduit underground and/or hung on utility poles. It is called "dark" because no network electronics are installed to "light" the fiber (using small lasers in a fiber switch). For small municipal/local government fiber installations, dark fiber has a significant advantage in terms of management—very little ongoing operational responsibility is required.

Dark fiber is leased out to service providers, who install their own network electronics in cabinets or shelters attached to the fiber cables. The providers typically lease fiber pairs between the cabinet and their customers, and are responsible for all equipment-related management and maintenance. Dark fiber networks can be used by service providers to provision either Active Ethernet or GPON services to their customers.

Dark fiber networks do not generate large amounts of revenue, but this is offset by very low maintenance costs—primarily an emergency break-fix arrangement with a local or regional firm qualified to splice fiber. Emergency break-fix contracts are usually based on a time and materials basis, so there is little or no expense if there are no fiber breaks.

Other costs include "locates," which are called in to Wisconsin 811 (Diggers Hotline) and are performed by either the local Public Works department or a private sector contractor. For small fiber networks, locate costs are generally modest.

About Lit Fiber

A "lit" fiber network includes the network electronics needed to transmit data over the fiber (using the small lasers in a fiber switch, hence there is light traveling over the fiber cable). In a lit network, "lit circuits" are leased out to service providers rather than fiber pairs. The muni/local government/community network provides the network electronics, which reduces costs for the service provider—meaning they are able to pay higher lease fees for the circuits they use to deliver services (like Internet) to their customers. Lit networks generate more revenue, but also have higher expenses because the network electronics have to be monitored and managed on a 24/7/365 basis (this task can usually be outsourced at reasonable cost). However, very small fiber deployments often do not pass enough homes or businesses to generate sufficient revenue to cover the higher costs.

Like dark fiber, a lit network incurs break-fix and locate costs as well.

4.3 WIRELESS TECHNOLOGIES

WISPs (Wireless Internet Service Providers) use a wide variety of radio frequencies to deliver fixed point wireless broadband. By "fixed point," this means that these systems are not designed to support roaming in the way that cellular voice/data radios are (that is, mobile phone and data services).

Fixed point broadband is broadcast from a tower to individual homes and businesses (fixed points). Most of the frequencies used require clear line of sight between the tower and the location where service is desired.

Hilly topography can work for or against good wireless broadband service. Towers located on the tops of hills and mountains can provide service over a larger area than a tower in relatively flat terrain, but hills also block the signal. A residence can be a short distance from a large tower, but heavy tree cover or an intervening hill will block service. The solution to this can be addressed in several ways:

More larger towers of 180' to 300'

The taller the tower, the wider the coverage, but as tower height increases, the cost of the tower also increases. Towers taller than 199' require a light at the top to make them visible to low-flying aircraft, and lighted towers are more expensive to erect, and the bulbs have to be changed periodically at significant expense. Many broadband towers are 180' to avoid the additional cost of lighting.

Small cell broadband utility poles

Small cell broadband utility poles, often called community poles, are shorter towers or utility poles of typically 60' to 80', located in or very near a cluster of homes. The towers can be wooden utility poles or relatively low cost steel monopoles or steel lattice towers. These towers are located to get above local tree cover so that clear line of sight to a distant taller tower is available. Local access point radios provide service to homes and businesses with line of sight to the pole. In many parts of Florence County, these are going to be an important part of a strategy to get better broadband to rural residents and businesses.

Variety of radio frequencies

WISPs are beginning to deploy a wider range of licensed and unlicensed radio frequencies to overcome distance, bandwidth, and line of sight issues. Traditional 2.4 Ghz and 5.7 Ghz WiFi and WiMax frequencies are being supplemented or replaced with LTE and CBRS licensed broadband frequencies that provide better bandwidth and will tolerate light tree cover better (2.5 Ghz, 3.5-3.7 Ghz). Some WISPs are also using lower frequencies (e.g. 900 Mhz) that will travel farther and will also provide better penetration in light tree cover.

4.4 EMERGING WIRELESS TECHNOLOGIES

MIMO Wireless

MIMO (Multiple Input, Multiple Output) describes a variety of technologies that can be summarized as using more than one receive and transmit antenna for wireless data applications. Wireless protocols that are using the MIMO concept include IEEE 802.11n (Wi-Fi), IEEE 802.11ac (Wi-Fi), 4G, LTE (Long Term Evolution), and WiMAX. Each of these protocols use the MIMO technology to increase the amount of available bandwidth in a given section of radio frequency spectrum.

New hardware is required to make effective use of MIMO. While the technology increases wireless bandwidth, the typical amount of bandwidth being used by wireless devices is also increasing rapidly. Some applications where MIMO is likely to provide noticeable improvements are in home

wireless routers, where the effective throughput will be able to better handle the demanding bandwidth requirements of HD and 4K video streams. MIMO is slowly being developed for use with cellular smartphones, but both the phones and the cell tower radios have to be upgraded to support MIMO.

LTE/4G/5G

LTE (Long Term Evolution) is a set of protocols and technologies designed to improve the performance of voice/data smartphones. Like MIMO, both the user phone and the cell tower radios have to be upgraded to support LTE improvements. In 2013, only 19% of U.S. smartphone users were able to take advantage of LTE speeds, although that percentage has been increasing rapidly since then, and more than 85% of the U.S. cellular towers have been upgraded to LTE. As noted previously, the actual bandwidth available to a smartphone user is highly variable and depends on distance from the cell tower, the number of smartphones accessing the same tower simultaneously, and the kinds of services and content being accessed by those users.

The primary purpose of cellular bandwidth caps is to keep cellular users from using too much bandwidth and degrading the overall service. While LTE and MIMO improvements will improve overall cellular service, these technologies are not going to replace fiber to the home and fiber to the business.

In 2017, new fixed broadband wireless systems entered the marketplace using LTE frequencies, and many WISPs have begun to replace existing wireless radio systems with LTE equipment. These LTE systems do not provide any cellular voice services; they are designed specifically to support only broadband/Internet service.

In our conversations with both vendors of these systems and WISPs that have begun deploying them, we get two different stories. The vendors have been conservative in discussing the improvements, while some WISPs have been taking single user test results and suggesting that they will be able to deliver higher speeds at greater distances to all users.

To achieve the full benefit of 5G technology, more fiber is needed.

There is little debate that the LTE equipment offers higher bandwidth, at somewhat greater distances, and with somewhat better penetration of light foliage and tree cover. Over the next two to four years, most WISPs will change out most of their existing radio systems for the improved LTE radios. Perhaps the most significant advantage of LTE fixed point broadband is its ability to provide better performance when clear line of sight between the customer and a tower is not available. LTE provides better penetration of light to moderate tree cover and other line of sight obstacles.

The official standard for 5G radio technologies was release in 2019, and many metro areas of the country now have 5G radio systems. It is worth noting that many smartphones, even some late model smartphones, do not have 5G support built in.

5G does bring much higher speeds to wireless broadband (e.g. it might be able to deliver 30 to 50 Meg of bandwidth consistently). But 5G has significant limitations that do not make it a good solution in rural areas of the U.S.

The fact that 5G can deliver much higher bandwidth means that 5G cell sites will require fiber connections. This is going to effectively limit 5G deployments to denser urban environments where both customers and fiber are plentiful.

There is no free lunch in the physics of radio frequencies. The higher bandwidth of 5G means that cell sites need to be closer together because the 5G frequencies do not travel as far as existing 4G/LTE frequencies currently being used by the cellular industry. Most users will have to be within 500 to 1,000 feet to receive 5G service.

Some experts estimate that more than a million miles of new fiber will have to be deployed just to support the 25 largest metro areas in the U.S. 5G will not appear overnight.

As many as eight to eleven cell sites per square mile may be needed to make 5G widely available in a given area. If, as an example, about 25%, or 125 square miles of Florence County is underserved, very conservatively, 1125 or more cell sites would be needed to provide good coverage (as many as nine or ten cell sites per square mile).

For rural areas, the cost of 5G service may be one of the most significant obstacles. The cellular carriers see the increased customer bandwidth use possible on 5G networks as a major revenue opportunity. While they will increase the "standard" bandwidth package for monthly service, bandwidth caps and rate limiting is likely to keep 5G cellular customers bills high.

Many rural areas of Florence County have poor or no cellular voice/data service, and somewhat counter-intuitively, more fiber can solve that problem. Cell towers need fiber backhaul connections to provide the best cellular data performance, and so rural fiber will also help address the issue of poor cellular service.

White Space Broadband

White space broadband uses some of the frequencies that were formerly used by analog TV channels. These lower frequencies travel farther and provide better penetration of light foliage. Microsoft has been supporting a number of community white space experiments, and has promised much wider support for this technology, but there are few other users, equipment is still relatively expensive, and few WISPs have ventured into this still largely experimental technology. A Microsoft white space project in southern Virginia, although still underway, serves less than three hundred households and is still regarded as experimental. Other white space pilot projects have reported good results. One ISP experimenting with the technology has indicated that their trials with white space equipment has been able to deliver 50 Meg/50 Meg service.

Low Earth Orbit (LEO) Satellite Internet

The Elon Musk-funded Starlink effort began offering "beta test" service in late 2020. There is a one time equipment and installation fee of $499, and a monthly fee of $99. The company is promising download speeds of between 50 Meg/sec and 100 Meg/sec and upload speeds of up to 20 Meg/sec. Latency is lower than traditional satellite Internet services. If the prices remain reasonable, this is likely to become a much better alternative to the older satellite Internet services.

In early fall of 2021, Starlink announced that the company would be moving the service out of beta, which would make the service more available to more users. The service has received generally favorable reviews from beta users in terms of speed and reliability. It will be important mostly for rural users who have line of sight problems for terrestrial fixed point wireless and for households and businesses that are completely outside the coverage area for fixed point wireless.

Service reports emerging in late 2021 indicated that Starlink was able to provide download speeds reliably at 50 Mbps to 75 Mbps, with a latency of 45 to 60 milliseconds. Low latency is critically important for good quality two way voice and video conversations.

By comparison, geosynchronous satellite service may have latency of ten to twenty times higher than Starlink. At the end of 2021, speed test results from the Ookla speed test service suggested that as Starlink is adding more customers, the average speed is flattening out, and Ookla's third quarter 2021 data was showing Starlink with average 87 Mbps download and 14 Mbps upload speeds, and average latency of 44 milliseconds.

Millimeter Wave Service

Millimeter wave services use a variety of very high frequency wavelengths in range of 30 Ghz to 300 Ghz. An emerging wireless broadband service that uses the term "millimeter wave" covers very short wavelengths in the 71-76 GHz, 81-86 GHz, and 92-95 GHz (70/80/90 GHz) bands. These shorter wavelengths permit the use of very small antennas while still being able to provide high directivity and high gain. A primary advantage of the smaller antennas is the ability to use more of them and to make each individual antenna highly directional. The higher frequencies also permit transmission of much higher bandwidth. However, the higher bandwidth rates are distance limited.

In early testing in 2020, U.S. Cellular was able to demonstrate speeds of 100 Mbps at distances of three miles using 5G radio equipment (5G equipment is also close to the millimeter wave spectrum using lower frequencies of 24 Ghz, 28 Ghz, and 39 Ghz for some equipment). Radio equipment tests are often conducted in optimum conditions, and in real world conditions, the practical distance may be lower and the bandwidth may be lower, where buildings and trees can degrade or block the radio signals.

5 NEW NORTH FIBERWAY

The counties of the New North region have widespread availability of fixed point wireless broadband Internet service. However, many areas lack access to fiber to the home service. A regional middle mile fiber network available to any qualified ISP or WISP could substantially accelerate deployment of fiber to the home and fiber to the business throughout the region by creating a single shared dark fiber network.

The benefits include:

- A single shared network with affordable access and use fees for any qualified ISP or WISP would reduce private sector ISP/WISP costs. More funds could be allocated by the private providers to connect homes and businesses (revenue generating customers) rather than funds spent on getting backbone/backhaul fiber near those customers (little or no revenue generation).
- A single regional network could be built at less cost than multiple providers each building disconnected portions of their own middle mile networks.
- A single regional network can be designed to be highly redundant, with multiple fiber rings, making the region very attractive to high tech businesses like data centers, cloud storage facilities, high performance computing facilities, and related technology companies that need access to highly resilient "fail resistant" networks.
- The middle mile network would enhance the ability of the WISPs in the region to offer higher speed fixed point broadband services–the fiber network would improve wireless Internet offerings and lower costs to WISPs.
- Once built, this network would have the potential to sharply reduce the cost of Internet services both to residences and businesses, but lower Internet costs would be extremely attractive to larger tech businesses evaluating relocation in the region.
- The network design provides an achievable road map and plan to be able to offer fiber to the home to the vast majority of rural homes and businesses in the region (as high as 84% of rural addresses).

The network can be constructed in phases according to available funding. The network would be operated as a multi-provider, multi-service open access network, providing network dark fiber routes to ISPs, WISPs, and any other qualified public or private sector customers. Users of the network could include:

- ISPs – ISPs could use the network to rapidly expand fiber to the home in their service area by reducing the cost of transport between FTTH service areas (e.g. residential subdivisions).
- WISPs – WISPs could use the network to provide fiber connections to their fixed point broadband wireless towers. This would improve wireless speeds and help reduce costs.
- Local government – Local government facilities could be connected to improve communications between offices. It could also support high performance monitoring of pump stations, water tanks, flood monitors, and other critical infrastructure.

- Health care – It can provide a redundant diverse path fiber route for Internet connectivity, which is critical to 24/7/365 access to remote medical record systems.
- K12 school systems – Schools may be able to reduce Internet and connectivity costs by using the regional network to connect schools together and to negotiate more favorable Internet connectivity fees.
- Data centers – The highly interconnected and multiply redundant fiber ring design would be highly attractive to data centers that would to expand beyond the major metro areas in the New North region.
- Telephone and electric coops – The coop utilities could use the network to reduce the cost of grid management and to accelerate their plans to offer fiber Internet service to their coop members.
- Incumbent telephone and cable providers – All incumbents would be invited to use the network to reduce their costs and to improve services to existing and new customers.

5.1 REGIONAL COLLABORATION

The New North FiberWay would be a regional consortium that would include leadership and guidance from each of the 18 counties (or all those counties that would choose to participate), interested local governments (e.g. area towns and cities), local and regional partners, and New North.

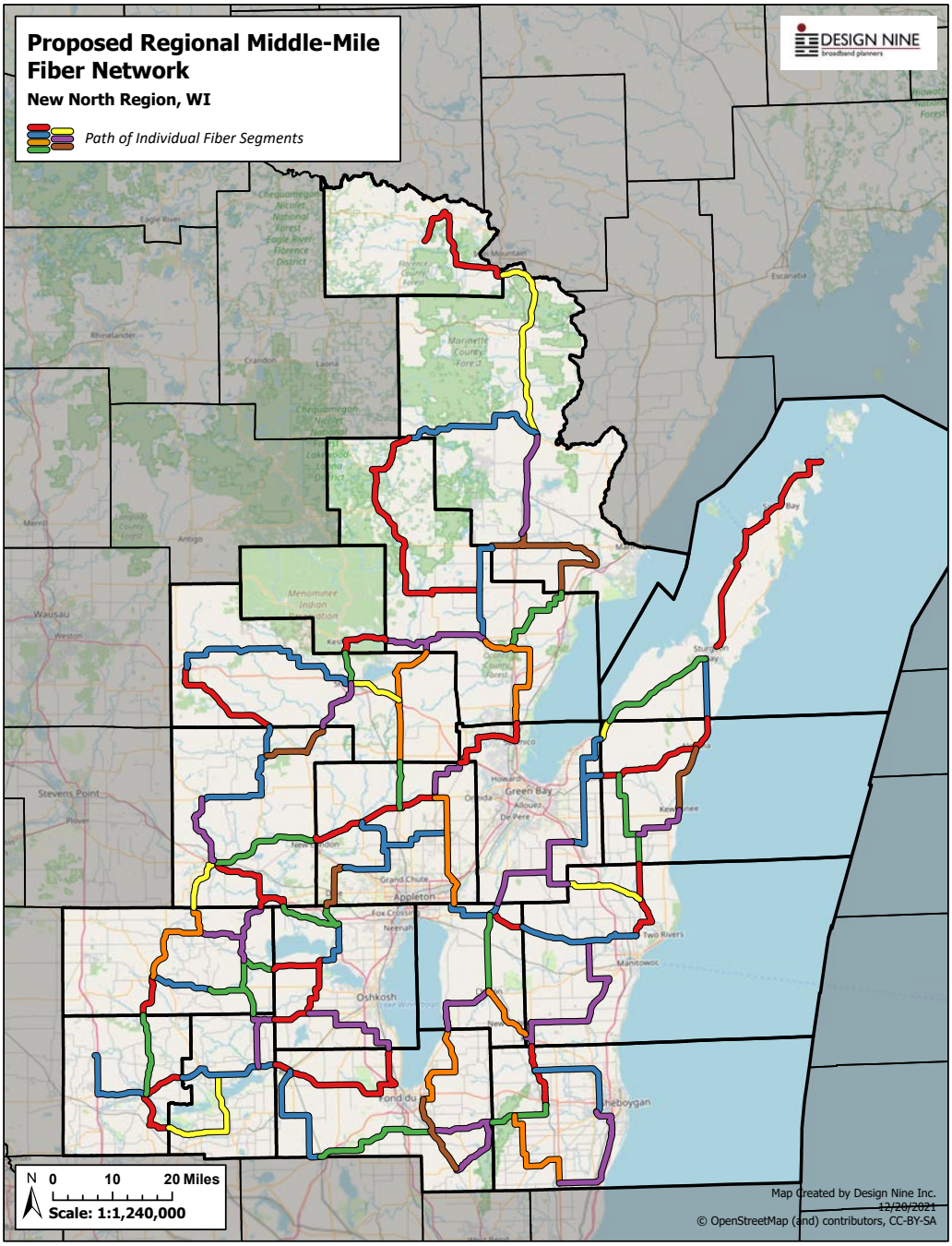
The FiberWay would not be a retail provider of services to businesses and residents in the region.

The FiberWay goals would include:

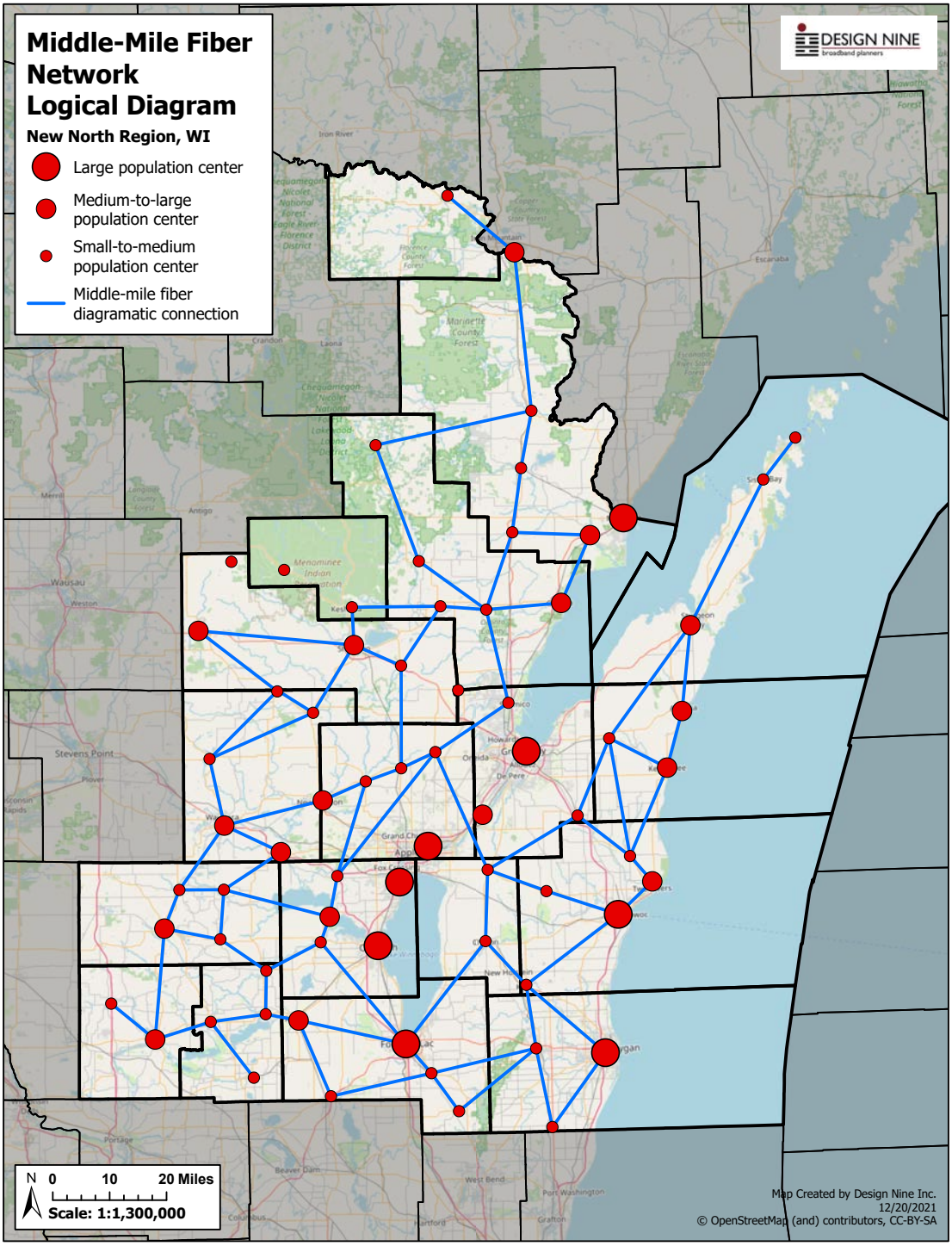
- Create a high performance fiber network for efficient management of physical network assets owned among the members of the consortium (e.g. telecom conduit, fiber cable, handholes, cabinets, network equipment).
- Provide improved management of fiber and conduit lease agreements and IRUs.
- Use the FiberWay to enable more efficient and lower cost price agreements for a variety of IP-based services, including Internet, network management services, and other services that could benefit from shared member purchases.
- Create a network infrastructure in the region to enhance business attraction, business retention and jobs creation. The FiberWay would provide wholesale access to private sector service providers to deliver a variety of services to business, commercial and residential customers.

The maps on the following pages illustrate a possible design and strategy for the New North FiberWay.

The map below shows a tentative design for a regional middle mile network. The design has been developed to provide multiple fiber rings, which makes the network highly resistant to outages and loss of service. The network would become a powerful economic development tool, and would enable more businesses to locate in the region, including locating in many rural areas of the region.

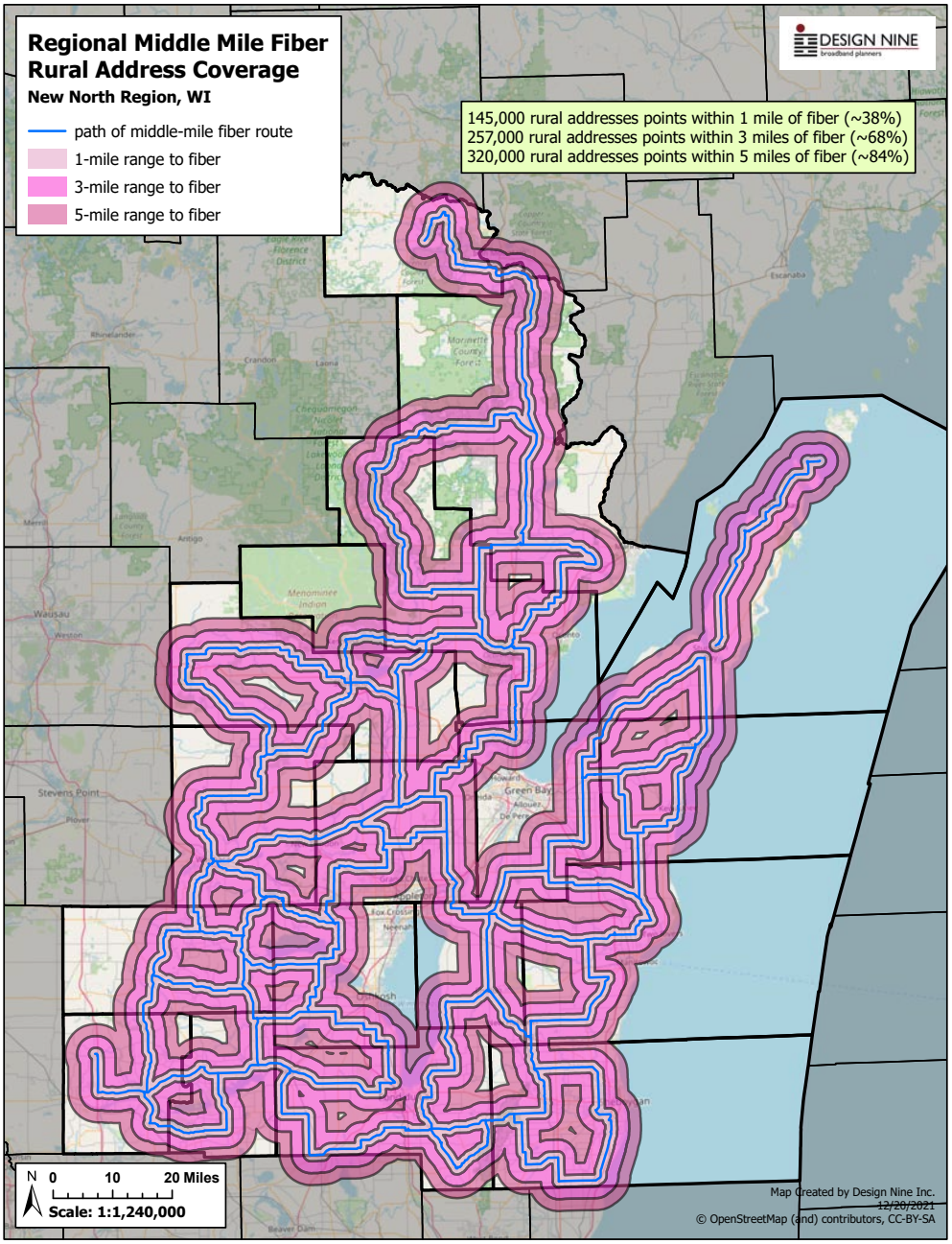


This map shows the underly design of the fiber route segments. The network routes were chosen to connect as many large, medium and small communities as possible in the region. Using this network, fiber to the home ISPs could quickly and easily expand fiber to the home and fiber to the business services throughout the region.



This map calculates address points (homes and businesses) within range of the proposed network.

- Within one mile of the proposed network, approximately 38% of rural address points in the region could be served.
- Within three miles of the proposed network, approximately 68% of rural address points in the region could be served.
- Within five miles of the proposed network, approximately 84% of rural address points could be served.



5.2 MIDDLE MILE NETWORK ROUTES

The table below lists the length of each network segment by county. More detail on costs for each county portion of the network is contained in the individual county-level reports.

Brown County			
Route ID	**Project Description**	**Total length (feet)**	**Total length (miles)**
BR1	Denmark NE to Dyckesville and Kewaunee County Line	136,944	25.94
BR2	Denmark SW to Calumet and Manitowoc County Lines	139,047	26.33
BR3	Oconto and Outagamie County Connector through Suamico	90,205	17.08
	Totals:	366,196	69.355
Calumet County			
Route ID	**Project Description**	**Total length (feet)**	**Total length (miles)**
CL1	Chilton SW to Fond du Lac County Line	64,754	12.26
CL2	Chilton SE to New Holstein and Kiel	55,043	10.42
CL3	Chilton to Hilbert and Forest Junction	67,586	12.80
CL4	Forest Junction east to Brillion and Manitowoc County Line	33,045	6.26
CL5	Forest Junction north to Outagamie and Brown County Lines	59,779	11.32
	Totals:	280,207	53.070
Door County			
Route ID	**Project Description**	**Total length (feet)**	**Total length (miles)**
DR1	Segment DR1-Sturgeon Bay North to Ellison Bay & Gills Rock	223,313	42.3

Distribution Type	Access Type	Capacity
Wireless	Wireless	Typical customer connection starting at 5 to 10 Megabits, can be higher, with 50 Meg connections common. More dependent on the capacity of the wireless Distribution link.
Wireless	Fiber	Users can have fiber Gigabit connections locally, but total throughput dependent upon the capacity of the wireless link, which can be up to a Gigabit, depending on distance and budget.
Fiber	Fiber	Any amount of bandwidth needed, with standard connection typically a Gigabit (1,000 Megabits).
Fiber	Wireless	Typical customer connection starting at 5 to 10 Megabits, can be higher, with 50 Meg connections common.
Fiber	Coax, DSL	Providers can use a fiber middle mile backbone and distribute improved broadband Internet services using copper-based coax (cable Internet) or DSL (copper phone lines).

DR2	Segment DR2-Sturgeon Bay due south to Kewaunee County line	52,934	10.0
DR3	Segment DR3-Sturgeon Bay south-west to Kewaunee County line	107,134	20.3
	Totals:	383,381	72.610
Florence County			
Route ID	**Project Description**	**Total length (feet)**	**Total length (miles)**
FL1	Town of Florence SE to Marinette County Line	136,403	25.834
	Totals:	*136,403*	*25.834*

Fond Du Lac County			
Route ID	**Project Description**	**Total length (feet)**	**Total length (miles)**
FD1	Fond du Lac east to Ripon and north to Winnebago County Line	160,541	30.41
FD2	Ripon to Waupun	111,529	21.12
FD3	Waupun to Village of Eden	117,346	22.22
FD4	Fond du Lac to Calumet County Line	95,856	18.15
FD5	Fond du Lac to Campbellsport	74,133	14.04
FD6	Eden and Campbellsport to Sheboygan County Line	118,404	22.42
	Totals:	677,808	128.373

Green Lake County			
Route ID	**Project Description**	**Total length (feet)**	**Total length (miles)**
GL1	Green Lake and Fond du Lac County Line to Princeton and Marquette County Line	92,486	17.52
GL2	Green Lake to Berlin and WInnebago County Line	66,246	12.55
GL3	Marquette County Line east and north to Rt 23	106,330	20.14
	Totals:	265,063	50.201

Kewaunee County			
Route ID	**Project Description**	**Total length (feet)**	**Total length (miles)**
KW1	Luxemburg to Algoma and Door County Line	125,144	23.70
KW2	Kewaunee to Algoma	61,118	11.58
KW3	Luxemburg South to Manitowoc County Line	94,380	17.88
KW4	Kewaunee SW to Rangeline Rd	54,527	10.33
KW5	Door and Brown County Connector	18,727	3.55
	Totals:	353,896	67.026

Manitowac County			
Route ID	**Project Description**	**Total length (feet)**	**Total length (miles)**
MT1	Manitowoc west to Reedsville and Calumet County Line	108,561	20.56
MT2	Kiel NE to Whitelaw	175,171	33.18
MT3	Manitowoc north to Mishicot and Kewaunee County Line	78,693	14.90
MT4	Mishicot west to Brown County Line	70,310	13.32
	Totals:	432,735	81.957
Marinette County			
Route ID	**Project Description**	**Total length (feet)**	**Total length (miles)**
MN1	Town of Beaver west and south to Oconto County Line	176,619	33.450
MN2	Beaver to Wausaukee	89,893	17.030
MN3	Wausaukee west to Oconto County Line	140,193	26.550
MN4	Wausaukee to Niagara and Florence County Line	175,960	33.330
	Totals:	582,665	110.360
Marquette County			
Route ID	**Project Description**	**Total length (feet)**	**Total length (miles)**
MQ1	Montello to Village of Westfield	78,280	14.83
MQ2	Montello to Waushara County Line	72,598	13.75
MQ3	Montello east and south to Green Lake County Line	88,609	16.78
	Totals:	239,487	45.357
Menominee County			

Route ID	Project Description	Total length (feet)	Total length (miles)
ME1	Keshena-Menominee County Connector	50,252	9.52
	Totals:	50,252	9.517
Oconto County			
Route ID	**Project Description**	**Total length (feet)**	**Total length (miles)**
OC1	Oconto Falls west to Shawano and Menominee County Lines	107,676	20.39
OC2	Oconto Falls SE to Brown County Line	120,967	22.91
OC3	Stiles to Marinette County Line	84,807	16.06
OC4	Oconto Falls north to Marinette County Line	93,356	17.68
OC5	Northern Oconto Connector	244,115	46.23
	Totals:	650,921	123.280
Outagamie County			
Route ID	**Project Description**	**Total length (feet)**	**Total length (miles)**
OG1	Seymour SW to Black Creek, Shiocton and Waupaca County Line	124,090	23.502
OG2	Seymour south to Kaukauna and Calumet County Line	109,455	20.730
OG3	Black Creek north to Shawano County Line	41,294	7.821
OG4	Central Outagamie Connector	168,138	31.844
OG5	Hortonville to Winnebago County Line	50,014	9.472
OG6	Seymour NE to Brown County Line	46,780	8.860
	Totals:	539,769	102.229
Shawano County			

Route ID	Project Description	Total length (feet)	Total length (miles)
SW1	Bonduel north and south to Oconto and Outagamie County Lines	118,079	22.36
SW2	Waupaca to Bonduel	47,557	9.01
SW3	Shawano south to Waupaca County Line	54,472	10.32
SW4	Shawano to Wittenberg	191,647	36.30
SW5	Wittenberg SE to Waupaca County Line	106,573	20.18
SW6	Shawano north to Menominee County Line	28,483	5.39
	Totals:	546,811	103.563

Sheboygan County

Route ID	Project Description	Total length (feet)	Total length (miles)
SB1	Plymouth to Fond du Lac County Line	57,889	10.960
SB2	Random Lake to Rt 67	106,299	20.130
SB3	Random Lake to Sheboygan	112,578	21.320
SB4	Plymouth to Manitowoc County Line	58,731	11.120
SB5	Sheboygan to Elkhart Lake	93,918	17.790
	Totals:	429,415	81.320

Waupaca County

Route ID	Project Description	Total length (feet)	Total length (miles)
WP1	Waupaca to Fremont & Winnebago and Waushara County Lines	104,918	19.870
WP2	Waupaca to Scandinavia and Iola	68,423	12.960
WP3	Waupaca to Waushara County Line	56,408	10.680
WP4	Waupaca to New London and Outagamie County Line	99,929	18.930
WP5	Iola NE to Marion and Shawano County Line	124,545	23.590
WP6	Emberrass to Clintonville and west to Rt 110	67,031	12.700

	Totals:	*521,254*	*98.730*
Waushara County			
Route ID	**Project Description**	**Total length (feet)**	**Total length (miles)**
WS1	Wautoma to Wild Rose and Waupaca County Line	104,206	19.740
WS2	Wautoma to Redgranite	54,495	10.320
WS3	Wautoma to Marquette County Line	40,291	7.630
WS4	Saxeville SE to Poy Sippi and NE to Waupaca County Line	102,009	19.320
WS5	Redgranite SE and NE to Green Lake and Winnebago County Lines	112,810	21.370
	Totals:	413,811	78.380
Winnebago County			
Route ID	**Project Description**	**Total length (feet)**	**Total length (miles)**
WB1	Winneconne west and South-west to Waushara and Green Lake County Lines	134,933	25.560
WB2	Winneconne to Larsen	45,179	8.560
WB3	Larsen north to Outagamie and Waupaca County Lines	77,113	14.600
WB4	Waukau to Fond du Lac County Line	102,327	19.380
	Totals:	359,552	68.100

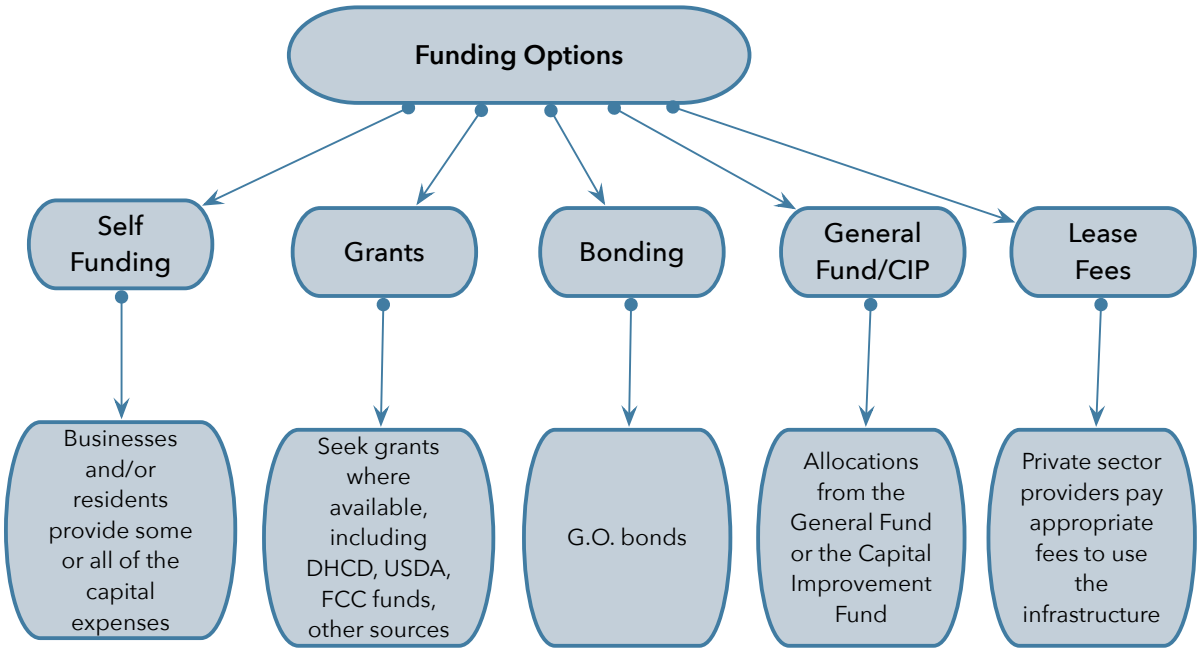
6 FUNDING AND FINANCING OPTIONS

It is important to note that any investment by local or regional government in broadband infrastructure should be focused on maximizing the long term benefits of such investments. Fiber, conduit, handholes, and wireless towers are stable assets that will provide service for many decades. This infrastructure can be leased to private sector service providers, generating long term revenue for maintenance and expansion.

Alternatively, funding for these investments can be provided to ISPs and WISPs as part of a public/private partnership (PPP). In a PPP arrangement, it will be better to require the private partner to provide the funding for shorter term assets, especially network electronics.

Leasing passive infrastructure like towers and dark fiber is not a "telecommunications service" (Wisconsin counties are forbidden by state statute from offering telecommunications services).

These assets will have a conservative life span of forty years or more (e.g. wireless towers, conduit, fiber cable). These types of infrastructure investments create hard assets that have tangible value and can then be leveraged for additional borrowing. The demand for services and the associated fees paid for those services will provide the revenue that will pay back loans over time. There is ample time to recoup not only the initial capital investment, but also to receive regular income from the infrastructure.



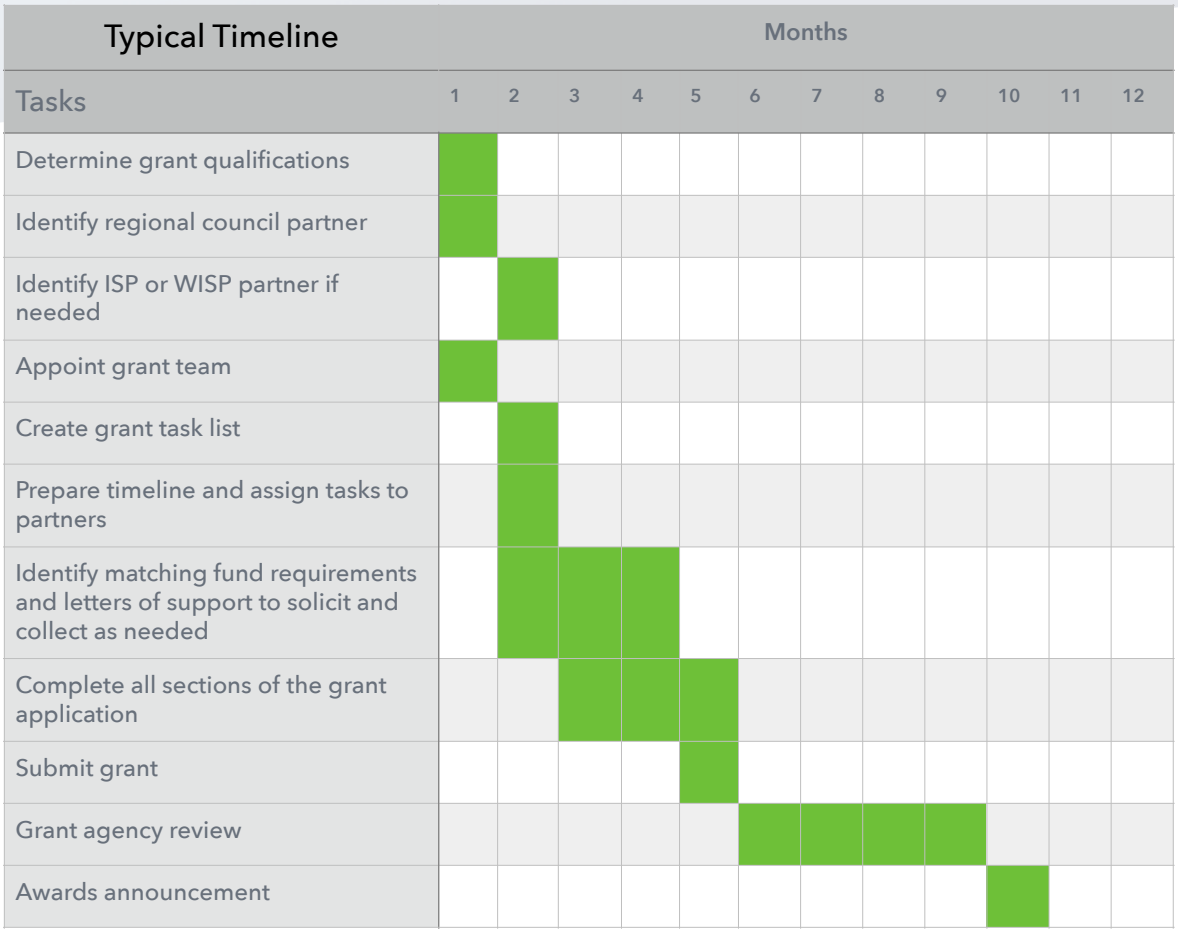
The financing of local government and/or community-owned telecommunications infrastructure faces several challenges with respect to funding.

Somewhat paradoxically, the cost of an all fiber digital road system is lower when there is a day one commitment to build to any residence or business that requests service. This maximizes the potential marketplace of buyers and attracts more sellers to offer services because of the larger potential market. This is so because:

- Service providers are reluctant to make a commitment to build network infrastructure without knowing the total size of the market. A larger market, even if it takes several years to develop, is more attractive.
- Funding agencies and investors that may provide loans and grants to a local or regional network project want to know how the funds will be repaid and/or that grants will contribute to a financially sustainable project. Knowing that the size of the customer base is the maximum possible for a service area helps reduce the perceived risk for providing loans and grants.

6.1 GRANT APPLICATION ACTIVITIES

Activity	Description	Discussion	Tasks
Develop a grant application	The grant application process, from start to award announcement, can be nine to twelve months.	Broadband grant application requirements have become more stringent over time, with more grant agency oversight and review. Careful planning is essential to develop a successful application.	• Once a grant opportunity has been identified, review grant requirements to determine if the project can qualify. For example, some grants require two years of financial history. • Identify regional agency that will assist • Begin contacting potential ISP partners. • If the project qualifies, identify at least two people to take the lead to prepare application. • Prepare a task list of all grant materials requirements and identify data needed. • Develop a timeline for developing sections of the grant. • Identify requirements for letters of support and matching funds and develop timeline to solicit and collect commitments. • Complete all sections of grant application with assistance from public and private partners. • Submit grant application.



6.2 WISCONSIN FUNDING OPPORTUNITIES

The Wisconsin legislature has been evaluating legislation to improve broadband access in the state. The bills are designed to make it easier and less expensive to build broadband infrastructure in underserved parts of the state. Wisconsin has created a state level Broadband Office that is coordinating and managing both state and Federal funding programs. In early 2021, Governor Evers committed nearly $200 million for broadband, and in 2021 the Broadband Office awarded tens of millions in broadband funds to Wisconsin towns, counties, and ISPs. Most awards required some match; awards to ISPs typically required much higher match amounts than awards to local governments.

New North should maintain regular communications with the Broadband Office to pursue every possible funding opportunity.

6.3 ARPA (AMERICAN RESCUE PLAN ACT) FUNDING

The American Rescue Plan Act of 2021, is the biggest federal funding program for broadband projects. ARPA has $350 billion in funding. Each state receives an ARPA fund allocation, and how much is targeted toward broadband initiatives will be decided by a state legislative committee and/or the governor of the state.

The 2020 CARES (Coronavirus Aid, Relief, and Economic Security Act) funding was typically distributed by state governments to localities (e.g. counties, towns, cities), which were then able to make decisions on how to spend the money within both the state and Federal guidelines attached to the funds.

ARPA funding has fewer requirements and "strings" attached than many other Federal broadband grant programs, and the New North counties should make obtaining ARPA funds for broadband projects a priority in 2022. Nearly $100 million in broadband funding for 2022 has already been approved by the State of Wisconsin, with an average match of 50%.

The State of Wisconsin has a well-organized Web page with much information on ARPA funding and how to apply (https://psc.wi.gov/Pages/Programs/BroadbandGrants.aspx). The next deadline for state broadband grants is March 17th, 2022.

6.4 HUD COMMUNITY DEVELOPMENT BLOCK GRANTS

The U.S. Housing and Urban Development CDBG State Program allows the Wisconsin state government to award grants to smaller units of general local government (e.g. counties, towns) that develop and preserve decent affordable housing, to provide services to the most vulnerable in our communities, and to create and retain jobs. In recent years, CDBG funds have been successfully used for broadband infrastructure development where the local government applicant can show the improvements meet the general guidelines of the program—so grant funds have to spent in low and moderate income areas.

Over a 1, 2, or 3-year period, as selected by the grantee, not less than 70 percent of CDBG funds must be used for activities that benefit low- and moderate-income persons. In addition, each activity must meet one of the following national objectives for the program: benefit low- and moderate-income persons, prevention or elimination of slums or blight, or address community development needs having a particular urgency because existing conditions pose a serious and immediate threat to the health or welfare of the community for which other funding is not available. More information is available here (https://www.hud.gov/program_offices/comm_planning/communitydevelopment/programs).

6.5 USDA RECONNECT PROGRAM

The ReConnect program is a new funding program managed by the USDA Rural Development Office. This program is sometimes called the USDA e-Connectivity pilot program. Grant applications can be a combination of 100% grant, 50% grant/50% loan, or 100% loan. $1.1 billion has been allocated to the program for 2022, and a wide variety of entities can apply, including non-profits, coops, and state and local governments.

As much as $200 million will be available for loans, with another $250 million allocated for loan/grant combinations. A $350 million fund will be distributed with a 25% matching requirement and another $350 million in grants with without a match, for projects in tribal and socially vulnerable communities. Applications are due in the spring of 2022, and USDA will begin accepting applications in late 2021. More information is available here: (reconnect.usda.gov). A mapping tool is available on the Web site to show areas that are eligible. To qualify as an eligible area, households must have less than a minimum of 10 Megabit down/1 Megabit up broadband service.

6.6 RDOF/CAF2 FUNDING

The second round of the FCC Connect America Fund (CAF2) (Rural Digital Opportunity Fund) continues to provide funds to incumbent and competitive service providers. The funds must be used in unserved or underserved areas as defined by Federal census blocks. To be eligible, a census block could not have been served with voice and broadband of at least 10/1 Mbps (based on Form 477 data) by an unsubsidized competitor or price cap carrier.

The FCC published the final eligible census blocks for the auction on February 6, 2018. The final areas were based on FCC Form 477 data as of December 31, 2016 (the most recent publicly available FCC Form 477 data at the time). So there is a time lag between the determination of a qualifying census block or blocks and the schedule for submitting a bid to serve those areas. The first round of funding was announced in early 2021, and was immediately met with widespread criticism. SpaceX (Starlink) was awarded almost $900 million, and it may have to return some of those funds because the company appears to have included some ineligible census blocks. Many large incumbents also received substantial awards when some smaller ISPs that might have offered competition to the incumbents received much less or no funds.

Because many CAF2 qualifying areas are only served by low performance DSL (e.g. less than 10/1 Mbps service), incumbent carriers use the awards to upgrade DSL switches, which is not a long term solution. More recently, competitive carriers are applying for CAF2 funds to provide higher performance broadband wireless and in some cases fiber to the home. Because the use of CAF2 funds are so restricted, it has not had as much impact as many hoped. The FCC, as of fall 2021, has not announced the rules for the second round of funding.

6.7 LEASE FEES

Initiatives like tower access and access to local government-owned conduit and fiber can create long term revenue streams from lease fees paid by service providers using that infrastructure. The City of Danville, Virginia has recovered their entire initial capital investment from lease fees paid by providers on the nDanville fiber network.

7 RISKS, LEGAL AND REGULATORY CONSIDERATIONS

7.1 FUNDING

Excellent leadership and hard-nosed business management of the enterprise are essential to the project's ability to obtain necessary funding. Although the network may be operated as a government effort, it must be managed with the same attention to costs, revenue, and financial administration as any private sector business. The project must be able to develop and maintain "investment quality" financial reports and business models to attract private sector sources of funding like revenue bonds, municipal leases, commercial loans, and business contributions. If investments are restricted to basic infrastructure like tower sites, fiber, towers, and equipment shelters, maintenance costs will be relatively low and it should be possible to structure attractive tower space lease rates to cover routine maintenance, minimizing financial risk and requiring limited funding.

7.2 SERVICE PROVIDERS

While in many respects a community broadband network shares many similarities with other public utilities (e.g. roads, water, sewer) there is one fundamental difference. Other public utilities like water and sewer have a captive audience and the utility is able to operate as a monopoly–meaning the customer base can be taken for granted. Early discussions with service providers have been positive, with at least two providers making requests for additional information about the effort.

A community broadband network is a public/private enterprise, and service providers are the primary customers of the network. Service providers cannot be taken for granted. Instead, a fair fee structure, a high quality network, excellent maintenance and operations processes, and organizational flexibility will be required to recruit and retain service providers.

Projects that are not successful in attracting service providers will fail. Affordable lease rates for tower space and/or fiber connections will attract service providers. Other open access projects(e.g. Danville, VA; New Hampshire FastRoads,; Bozeman Fiber; Utopia/Salt Lake City area) have not had any difficulty getting service providers to use the infrastructure. Indeed, the Utopia project has twenty-three providers on its network.

7.3 TECHNOLOGY

A question that often dominates early discussions of community broadband projects is, "Are we picking the right technology and systems?" Everyone has experienced the rapid obsolescence of computers, cellphones, printers and other IT equipment.

There is always some risk associated with making a substantial investment in a network. However the risk can be managed. In a predominantly fiber network, a large portion of the investment will be dedicated to getting fiber in the ground or on poles throughout the community. Properly installed fiber has a minimum 30 to 40 year useful life, and fiber installed by the telephone companies in the seventies is still in use today. Fiber also has a useful property not shared with

other public systems like water, roads, and sewers. The capacity of fiber can be increased without replacing the fiber or adding additional fiber. Instead, fiber capacity can be increased indefinitely by replacing the electronics at each end of the fiber. This means that a community investment in fiber creates a stable, long term asset for the community with long lasting value.

The equipment used to light the fiber has a shorter useful life, and is usually depreciated over a period of 7 to 9 years. Some equipment may remain useful longer than that. Wireless equipment must be replaced much more often (typically 2 to 4 years of useful life) because it is typically exposed to much harsher conditions (extreme heat and cold, lightning strikes, ice, snow, rain, wind).

The primary technology risk is selecting a vendor who provides equipment that does not perform as advertised. This risk can be managed by a careful procurement process which would include a careful analysis of network capacity and features, detailed RFPs that specify equipment features and functions explicitly, and a thorough RFP evaluation process.

7.4 LEGAL AND REGULATORY ISSUES

Regional and local government-owned broadband projects are subject to state and Federal regulations of various kinds, but unless a project is offering retail services (e.g. the local government is selling Internet, TV, and/or voice services directly to residents and businesses), there are limited regulatory issues. The City of Eagan's AccessEagan Gigabit fiber network has been in operation for seven years, and has four private sector service providers offering services. There has never been an incumbent legal challenge because incumbent providers like Comcast and CenturyLink have been invited to use the network (both have repeatedly declined).

The key strategy is for local government-owned projects to adopt the wholesale model of leasing passive infrastructure like towers and dark fiber and for active networks (with network electronics) to lease circuits to providers on a wholesale basis rather than selling retail services. While Wisconsin law prohibits local governments from offering telecommunications services, the dark fiber leasing model proposed for the middle mile network in Section 5 is not a telecommunications service, and local government and/or regional entities would not be selling any telecommunications services.

The Utopia project, which offers services in fourteen communities in the Salt Lake City area, has been targeted in the past as a "failed" effort but has overcome some early financial challenges and today has 23 private sector providers offering a wide range of price points and service packages—delivering true choice and competition to citizens and businesses. The wholesale model is not subject to many of the FCC (Federal Communications Commission) regulatory requirements.

8 NETWORK OPERATIONS CONSIDERATIONS

8.1 ESTIMATED TIMELINES FOR COMPLETION

Each kind of project will have its own timeline, and will vary widely depending on the type of funding. ***Grant-funded projects may need six months to one year to plan and apply for funding***, depending on where in the grant cycle the network owner commits to applying for a grant and the length of time that the grant agency takes to review and approve grants.

Tower improvements and construction times can be dependent on weather (more weather related delays are likely in late fall through early spring) and on procurement. Most grant-funded projects require careful attention to a public procurement process, which can add 90 to 180 days to the timeline.

In 2022, supply chain issues and high demand for materials (e.g. towers, conduit, fiber cable, handholes, network switches) could add significantly to the times projected below, primarily in the Project Procurement phase. ***Orders for material should be given a very high priority*** once a project has been funded—that is, consider ordering materials as soon as an award has been made.

Broadband Construction Timetable

Project Type	Project Execution Planning	Project Procurement	Project Engineering and Construction	Total Estimated Timeline
Improvements to existing towers	2-3 months	3-4 months	2 months	7-9 months
New towers of 180 ft	4-6 months	4-5 months	4-8 months	12-19 months
Small cell community broadband poles	3 months	2 months	2 months	7 months
Public WiFi Hotspot	3 months	1 month	1 month	5 months
Point to point tower backhaul links	2-3 months	3-5 months	1-2 months	6-10 months
Fiber to the home/ business projects	4-6 months	4-6 months	6-12 months	14-24 months

8.4 DARK FIBER LEASE CONSIDERATIONS

Passive fiber infrastructure (i.e. no electronics) can include conduit, fiber cable, splice closures, and cabinets. Because all powered network equipment would be provided by the lessee (i.e. the ISP), there is no day to day management responsibilities and only occasional routine maintenance. Emergency break-fix for situations like a cable broken by a construction firm working in the right of way can be outsourced to a qualified private sector provider. Local governments routinely manage much more complex water and sewer systems. Some guidelines for leasing dark fiber include:

- There should be a single public price list for the cost of leasing fiber strands.
- A standard master agreement should be used for leases. This agreement will typically require an SLA (Service Level Agreement) that specifies repair times for emergency break-fix (i.e. the fiber cable has been damaged and a qualified break-fix repair firm must be on call to make repairs).
- It will also be important to have IRU pricing (Indefeasible Right of Use). Fiber strand leases are typically for periods of ten years or less. IRUs are long term leases and are typically twenty to thirty years in length. IRU fees have two parts: a single upfront payment that usually reflects some portion of the construction cost for the fiber route. As an example, if a lease will include twelve strands of fiber on a ten mile route of 144 strand fiber that cost $100,000 to construct, the one time fee might be 12/144 * $100,000 = $8,333. Most IRUs also have a modest annual maintenance fee that reflects the cost of maintenance and repairs; this would also be pro-rated to reflect the number of fibers assigned to the IRU agreement.
- Splice points and who is allowed to open handholes to perform splicing must be identified in the master agreement.

8.2 GETTING STARTED WITH A REGIONAL STRATEGY

Identify the appropriate existing regional entity to lead the effort	Identify an appropriate regional entity (New North Inc. would be ideal) to take the lead to develop the middle mile effort.
Articulate the need for the enterprise	Create a concise and specific set of goals and objectives. What will the enterprise look like in three years, five years, and ten years? What services will the enterprise offer now and in the future?
Identify an Leadership Board	Identify prospective members, which should start with a representative from each county. At least some members need demonstrated success with business startups and business management. At least some members of the steering committee should be willing to serve as board members when the enterprise is formally created.
Schedule an initial meeting	Develop a timeline and year one goals

Get ISPs and WISPs involved	Invite ISPs and WISPs in the region to become members of an Advisory Committee (separate from the Leadership Board). Advisory Committee member will have valuable insights and recommendations that should be considered carefully.
Identify early funding opportunities	Grants, start up capital, and membership fees can be early sources of funding.

8.3 REGIONAL COLLABORATION ROLES AND RESPONSIBILITIES

Leadership Board

Each member of the Leadership Board is entitled to appoint a Member and Alternate to the Board. The general purposes of the Board are to:

- Provide structure for administrative and fiscal oversight of the enterprise;
- Set appropriate policies;
- Maximize the use of available resources;
- Seek and utilize input from the Advisory Committee.

The Board's general responsibilities will include:

- To make and enter into contracts:
- For acquiring real and/or personal property and equipment
- For employment and professional services
- With members, users, or ISPs and WISPs that desire to utilize the infrastructure;
- To acquire, construct, manage, maintain, and operate the dark fiber network;
- To apply for and hold any required licenses or permits;
- To apply for, receive and utilize grants and loans;
- To accept donations;
- To incur debts and obligations as permitted by law;
- To promulgate, adopt, and enforce any rules and regulations, as may be needed for the successful operation of the enterprise.

Specific responsibilities of the Board will include:

- To approve contracts with commercial vendors regarding development, operation, marketing, public relations, maintenance and expansion of any network infrastructure owned by the enterprise;
- To approve and revise, as necessary, a plan defining the physical aspects of the infrastructure (i.e. the "Network Infrastructure Plan") and a plan for funding the creation of, and ongoing operation of the system (the "Infrastructure Funding Plan");
- To adopt an annual budget for the enterprise;

- To develop policies regarding accounting, contracting and procurement, employment, operations and maintenance, asset replacement;
- To adopt bylaws and other rules and regulations as necessary;
- To acquire or lease real property as required for operations;
- To discharge other duties consistent with the goals or the organizations as appropriate or required by statute.

Advisory Committee

The Advisory Committee should be a set of people invited by the Leadership Board to provide the Board and the Broadband Coordinator with guidance and input on strategy, direction, and funding. Members of the Advisory Committee could include WISPs, ISPs, health care facilities, K12 schools, colleges and universities, Chambers of Commerce, and business enterprises.

Broadband Coordinator

The Broadband Coordinator (BC) should be a well-qualified individual with significant experience in business development and a track record of success in the management of enterprises with significant assets. The BC does not necessarily have to have a telecom background. The BC should be hired with the expectation that he or she will have primary responsibility for developing the enterprise into a successful regional broadband enterprise.

The Broadband Coordinator will report to the Leadership Board and will be responsible for the management of staff and all contractors.

Vendors and Contractors

The enterprise will use a variety of third party contractors, vendors, and consultants to support the business. These services include:

- Locates - Any construction in public right of way requires that the contractor notify Miss Utility (Wisconsin 811) services so that utility locates can take place. The enterprise could save the localities money by managing locates for all fiber assets, offering a single larger contract rather than the current arrangement of several smaller contracts.
- Break-fix and routine maintenance - fiber and wireless resources will have to be repaired quickly if damaged or out of service. A contract with a qualified firm to respond to wireless radio repairs and/or fiber breaks will be required. In the region, a minimum four hour response time to have a truck and repair crew on site will be required, and it may be that a two hour response time is deemed necessary. Note that many kinds of repairs and maintenance will NOT require an immediate response.
- Network operator - The network operator will be responsible for monitoring the equipment located at each network equipment site (e.g. wireless radios, fiber switches, etc.) point (typically a telecom cabinet or equipment shelter). The operator will also troubleshoot any fiber cable or network equipment problems and coordinate any required repairs.
- Accounting - Bookkeeping and accounting work could be outsourced to a qualified accounting firm that performs the work under contract.
- Marketing - The entity may make occasional use of an ad agency or marketing firm for assistance with marketing materials (e.g. logo design, Web design, brochure design, etc.). While Service Providers will be responsible for their own marketing and must negotiate their

own sales contracts with customers, business success will be determined in part by enterprise supported, ongoing marketing and awareness efforts.

- Engineering - Engineering and design work will be needed for network expansion projects (e.g. wireless towers, fiber routes, etc.).
- Construction - The enterprise may manage the construction of new wireless fiber and conduit extensions on behalf of localities as needed.
- Legal Counsel - Telecom counsel with municipal government experience will be needed to assist with provider and network capacity lease contracts (e.g. tower leases, circuit leases, dark fiber leases).

Activity	Responsibility
Financial Oversight	Board of Directors
The regional management entity and the Leadership Board will provide financial oversight and fiscal agency.	
Bookkeeping and Accounting	Enterprise or contracted accounting firm
The network will generate a relatively light set of accounts payable and accounts receivable tasks, along with normal financial reporting (e.g. income statement, cash flow, balance sheet, etc.).	
Network Monitoring and Network Management	Designated Operator
The enterprise must have a 24/7 monitoring and management process in place to respond to routine and emergency repairs. Virtually all network management tasks and activities can be outsourced to a qualified private sector firm (the Designated Operator) that specializes in this work.	
Break-Fix	Designated break-fix firm
The enterprise must have a contract in place for 24/7/365 emergency repairs to conduit and fiber.	
Routine Equipment Maintenance	Designated Operator
Routine and preventative maintenance on the passive network components will be occasional at best, but enterprise staff and/or a qualified fiber contractor must be able to make routine (scheduled) repairs as needed on both passive and active network components.	
Utility Marking Services	Third party locating service
The enterprise will have to be registered with the Wisconsin 811 service and must be prepared to manage locate requests (which have to be completed in a specified period of time)	
Site Maintenance	Designated maintenance firm
The enterprise will be responsible for regular maintenance activities at any sites that the enterprise has agreed to maintain, including mowing, painting, replacing lights, and related maintenance.	
Network Operations	Designated Operator
The enterprise must be able to respond to emergency break-fix alerts and be prepared to manage the repair process on nights and weekends.	
Inventory Management	Designated Operator
The network operator will maintain an inventory of tower assets, wireless radio equipment, in-use conduit, fiber cable, handholes, and patch panel ports, and also maintain the spares inventory.	
Network Marketing and Awareness	Enterprise
The enterprise will develop and maintain a modest and ongoing awareness and marketing effort to ensure that residents and businesses are aware of the broadband effort and new service options.	

9 PARTNERSHIP OPPORTUNITIES

Because nearly all telecom infrastructure includes some use of public right of way, public/private partnerships are always a requirement for broadband infrastructure. Among the New North counties and private entities like ISPs and WISPs, the more common synergies are:

- The need for more bandwidth,
- The need for more affordable bandwidth, and
- The need for more affordable bandwidth to be more widely available.

Potential project partners include:

ISPs and WISPs

Throughout the U.S., many WISPs are aggressively pursuing public-private partnerships (PPPs) with county governments. These partnerships may include a variety of strategies: collaboration on a grant opportunity, shared costs of developing a new tower site, revenue sharing, fee waivers, and other sorts of cost and revenue sharing. The advantage of this kind of PPP is that the WISP typically is responsible for most of the day-to-day management of the network assets.

The counties in the New North region can pursue public/private partnerships with technically qualified and financially stable ISPs and WISPs. Where appropriate, the counties can channel grant funds to providers while will use the funds to build and manage new broadband infrastructure.

Selected providers should be able to show technical competency and have a demonstrable track record of managing substantial fiber and/or wireless builds on time and within budget. It will also be important for any public/private partnership agreement have a claw-back agreement. When public funds are transferred to a private company, the counties should have the ability to "claw back" the built infrastructure for a minimum of five to ten years.

Conditions for a claw back could include bankruptcy of the ISP, sale to a third party (where substantial profit taking leverages the public funds), poor service, unreasonably high cost of service, and/or poor service reliability.

Public Safety

Sheriffs departments, fire, and rescue departments all need better access to broadband and improved wireless voice/data communications. Throughout the United States, public safety voice and data communications systems are being upgraded, often at staggering cost. Many of the upgrades include new towers to eliminate "holes" in the served area where first responder, fire, and rescue radios do not work. Combining public safety needs with community broadband needs can bring new sources of funding and cut costs, sometimes dramatically. Elected officials may need to take the lead in this area to ensure that public safety officials work collaboratively with the broadband efforts.

The availability of public-safety towers and/or new towers can enable new services and applications for police, fire, and rescue in the individual counties of the New North region. Secure WiFi hotspots can be set up around and near the towers, so that reports can be filed from the field using the WiFi Internet connection. Other communities that have done this have found that it saves time and keeps patrol cars out in the field longer.

There are often grants available for public-safety voice and data communications improvements, like new towers and upgrades to existing tower facilities, that could also support the broadband initiative. Any public-safety tower or communications expenditure should be analyzed to determine if the expenditure can also support expanded broadband access in the New North counties.

K12 Schools

Most schools in the region have adequate broadband service at existing school locations. But K12 students often lack adequate Internet service at home, and some schools are careful not to assign homework that requires Internet access. Parents consistently report on the burden of having to drive children to a public library or some other WiFi hotspot to get Internet access for school work. The counties should work with the schools to apply for education grant funds to achieve this goal, and to keep K12 parents informed about broadband activities.

County and Regional Businesses

Businesses in the region and the local Chamber of Commerce chapters have an important role to play as advocates for the broadband work of the counties and regional broadband efforts. At both the county and state level, businesses that need more affordable and better broadband should ensure that elected officials understand the urgency. New North counties, as part of their broadband awareness efforts, should ensure that local businesses are kept up to date with work activities, grants, and other efforts (e.g. attend CoC meetings at least quarterly to report on the work of the counties and any regional broadband efforts).

Electric Utilities

Electric utilities are natural partners in any broadband venture. Electric utilities own utility poles, bucket trucks, and the equipment needed to install aerial fiber. Chattanooga's fiber to the premises (FTTx) initiative has enabled millions in savings for the city-owned electric service. When power outages occurs from events like ice storms or tree damage, the utility is able to use the fiber network to very accurately pinpoint where the outage occurs, enabling a more rapid repair of the electric network at less cost.

New North and the individual counties should meet from time to time with the local electric utilities to assess their interest in broadband projects, especially if one or more of the local governments and the electric utility could collaborate on fiber to electric service substations.

APPENDIX A: GLOSSARY

Active network: Typically a fiber network that has electronics (fiber switches and CPE) installed at each end of a fiber cable to provide "lit" service to a customer.

Asymmetric connection: The upload and download bandwidth (speed) are not equal. Cable Internet and satellite Internet services are highly asymmetric, with upload speeds typically 1/10 of download speeds. Asymmetric services are problematic for home-based businesses and workers, as it is very difficult to use common business services like two way videoconferencing or to transfer large files to other locations.

Backhaul: Typically refers to a high capacity Internet path out of a service area or locality that provides connectivity to the worldwide Internet.

Colo facility: Colo is short for Colocation. Usually refers to a prefab concrete shelter or data center where network infrastructure converges. A colo or data center can also refer to a location where several service provider networks meet to exchange data and Internet traffic.

CPE: Customer Premises Equipment, or the box usually found in a home or business that provides the Internet connection. DSL modems and cable modems are examples of CPE, and in a fiber network, there is a similarly-sized fiber modem device.

Dark fiber: Dark fiber is fiber cable that does not have any electronics at the ends of the fiber cable, so no laser light is being transmitted down the cable.

Drop: A telecom term for the small fiber cable that is installed from the street or a utility pole to a home or business.

Fiber switch: Network electronic equipment usually found in a cabinet or shelter

Fiber Optic Splice Closure: See **FOSC**.

FOSC: Fiber Optic Splice Closure. Typically a water and air tight cylindrical container where fiber cable is split open to allow splicing (connecting together) of fiber strands for a drop to a premises.

FTTH/FTTP/FTTx: Fiber to the Home (FTTH), Fiber to the Premises (FTTP), and Fiber to the X (FTTx) all refer to Internet and other broadband services delivered over fiber cable to the home or business rather than the copper cables traditionally used by the telephone and cable companies.

Handhole: Handholes are open bottom boxes with removable lids that are installed in the ground with the lids at ground level. The handholes provide access to fiber cable and splice closures that are placed in the handhole. Handholes are also called **pull boxes**.

IP video: Video in various forms, including traditional packages of TV programming, delivered over the Internet rather than by cable TV or satellite systems.

Latency: The time required for information to travel across the network from one point to another. Satellite Internet suffers from very high latency because the signals must travel a round trip to the satellite in stationary orbit (22,500 miles each way). High latency makes it very difficult to use services like videoconferencing.

Lit network: A "lit"network (or lit fiber) is the same as an active network. "Lit" refers to the fact that the fiber equipment at each end use small lasers transmitting very high frequency light to send the two way data traffic over the fiber.

MST: Multiport Service Terminals are widely used in fiber to the home deployments to connect individual home drop cables to larger distribution cables on poles or in handholes. Pre-connectorized drop cables snap into the MST ports and do not require any splicing.

Passive network: Refers to infrastructure that does not have any powered equipment associated with it. Examples include wireless towers, conduit (plastic duct), handholes, and dark fiber.

Pull boxes: Pull boxes (also called handholes) are used to provide access to fiber cable and splice closures. They are called pull boxes because they are also used during the fiber cable construction process to pull the fiber cable through conduit between two pull boxes.

Splice closures: Splice closures come in a variety of sizes and shapes and are used to provide access to fiber cable that has been cut open to give installers access to individual fiber strands. Splice closures are designed to be waterproof (to keep moisture out of the fiber cable) and can be mounted on aerial fiber cable or placed underground in handholes. Also called **FOSC**s.

Splicing: The process of providing a transparent joint (connection) between two individual fiber strands so that laser light passes through. A common use of splicing is to connect a small "drop" cable of one or two fiber strands to a much larger (e.g. 144 fiber strand) cable to provide fiber services to a single home or business.

SCADA: Supervisory Control and Data Acquisition. Used by the electric utility industry and some other utilities (e.g. water/sewer) to manage their systems.

Symmetric connection: The upload and download bandwidth (speed) is equal. This is important for businesses and for work from home/job from home opportunities.

Virtual Private Network: A VPN creates a private, controlled access link between a user's computer and a corporate or education network in a different location. VPNs are often encrypted to protect company and personal data. VPNs usually require a symmetric connection (equal upload and download speeds) to work properly.

APPENDIX B: STAKEHOLDER MEETING ATTENDEES

NEW NORTH BROADBAND STUDY STAKEHOLDER MEETING ATTENDEES

September-December 2021

Approximately 180 Total Participants (excluding Design Nine/MSA/DP/New North staff)

Brown County (October 28, 2021)

- Meeting with August Neverman, Broadband & BCCAN Director, Brown County

Calumet County (October 10, October 20, 2021)

- Matt Payette - Business Systems Analyst and Communications Manager, Calumet County
- David Detroye – Administrator, City of Chilton
- Vicki Tessen – Village of Harrison
- Dan Nett – New Holstein School District
- Susan Kaphingst – Chilton Public Schools
- Sam Schroeder – Development Director, City of Menasha
- Casey Langenfeld – New Holstein Town Administrator
- Adam Holzman – IT Director Waupun Area School District
- Barbara Koldos – New North
- Erin Gerred – Director of Administration, FdL County
- Robyn Gruner – AT&T Director of External Affairs
- Hertha Longo – St. Agnes
- Jason Wied – COO Bug Tussel
- Jeff Butz - Surveyor
- Jessica Slavin – Attorney, Averbeck, Hammer & Slavin
- Kevin Baker – CFO Baker Cheese
- Larry Plammann – Director of Network Services, Moraine Park technical College
- Mitchel Olson – Bug Tussel
- Steve Brooks
- Jeff Stanek – Waupun Utilities
- Troy Allen Seyfert
- United Way
- Greg P

Door County

- Several meetings and calls with Steve Jenkins, Executive Director, Door County Economic Development Corporation

Florence County (September 29, 2021)

- Wendy Gehloff, Economic Development Director, Florence County

Fond du Lac County (October 27, November 2, 2021)

- Lisa McArthur – Envision Greater Fond du Lac
- Jens Jorgenson – US Cellular
- Brandon Mcnoon - McNeilus Steel
- Jean Pauly McNeilus Steel
- Don Breth – Town of Calumet
- Ken Camps – Town of Rosendale
- Mike Schumacher – Michaels Corp
- Kathy Schlieve – City of Waupun
- Greg Michels – Treasurer, Town of Lamartine
- John Bord – Chair, Town of Marshfield
- Jeff Liddicoat – Horicon Bank
- Adam Holzman – IT Director Waupun Area School District
- Barbara Koldos – New North
- Erin Gerred – Director of Administration, FdL County
- Robyn Gruner – AT&T Director of External Affairs
- Hertha Longo – St. Agnes
- Jason Wied – COO Bug Tussel
- Jeff Butz - Surveyor
- Jessica Slavin – Attorney, Averbeck, Hammer & Slavin
- Kevin Baker – CFO Baker Cheese
- Larry Plammann – Director of Network Services, Moraine Park technical College
- Mitchel Olson – Bug Tussel
- Jeff Stanek – Waupun Utilities
- Steve Brooks
- Troy Allen Seyfert
- United Way
- Greg P – business owner
- Mark Kastein – Owner, Quest Interiors
- Katherine Vergos – President, St. Agnes Hospital

- Peter Wilke – Executive Director, Fond du Lac Festivals, Inc.
- Noah Saecker, Technology Director, Rosendale-Brandon School District
- Tony Steinmetz –Networking Communications Administrator, Marian University
- Frank Sonderer – RB Royal Industries

Green Lake County (December 16, 2021)

- Carl CartWright – Berlin Area School District Superintendent
- Jerry Chisnell – City of Markeson, CTO
- Kristin Lambrecht – Bug Tussell
- Lisa Meier – GLACC director
- Mary Neubauer – Princeton Clerk

Kewaunee County

- Ben Nelson – Economic Development Director, Kewaunee County

Manitowoc County (October 28, December 9, 2021)

- Jamie Zastrow – Executive Director, Progress Lakeshore
- Beth Kohlman – Associated Bank
- Ralph Schuh –Chair Town of Kossuth,
- Polly Abts – Lakeshore Tech College
- Cary Nate – Town of Franklin
- Bob Zieglebauer – Chairperson, Manitowoc County
- Luke Kalista – Manitowoc County
- Jerry Paul – Town of Kossuth
- Barbara Koldos – New North

Marinette County (September 27, 2021)

- Jenny Short – Director, Marinette Count Economic Development and Tourism

Marquette County (September 30, October 29, 2021)

- Keri Solis – Coordinator, Marquette County ED and Tourism
- Jerry Schneider – CEO, Marquette-Adams Telephone
- David Lockstein – IT Director, Montello School District
- Adam Malsack – Owner, Lake Arrowhead Campground

Menominee County (October 5, 2021)

- Jeremy Weso – Menominee County Administrative Coordinator and Town of Menominee

Oconto County (September 29, 2021)

- Wayne Sleeter – Oconto County ED

- Chelsea Anderson - Gillett
- Jamie Sellen – Oconto County ED

Outagamie County (October 29, 2021)

- Approximately 30 attendees, mostly schools and towns

Shawano County (September 28, October 6, 2021)

- Newel Hafner, Ben Heninger – Gresham Schools
- Eddie Sheppard – City of Shawano
- Jim Davel – Director of Emergency Management, Shawano County
- Shawano Schools
- Jesse Rankin – Director of Operations, Village of Bonduel
- Mark Dodge – Bertram Wireless
- Peter Thillman – Shawano County ECDC
- Al Quinney – Executive Director, Stockbridge-Munsee Band of Mohicans
- Brian McDonald – CIO, Stockbridge-Munsee Community

Sheboygan County (October 12, October 20, 2021)

- Dee Olsen – Executive Director, Sheboygan Chamber of Commerce
- Deidre Martinez – Executive Director, Sheboygan County Chamber
- Tom Schuchart – Win Technologies
- Jackie Veldman – Town of Mitchel
- Dave Augustin – Plymouth IT Director
- Wayne Eschen – Sheboygan Area Schools
- Julie Wicker – Town of Wilson
- Jessica Reilly – Clerk, Town of Herman
- Eric Bushman – City of Sheboygan IT
- Mark Dodge – Bertram Communications (Random Lake)
- Mary Houser – Plymouth Chamber of Commerce
- Mike Nikson – Sheboygan Falls School District IT Director
- Josh Schuren - Sheboygan Falls School District Network Administrator
- Luanne Rady – Town of Scott
- 3 other town representatives

Waupaca County (September 27, October 5, 2021)

- Richard Letto – Amherst Telephone
- Ryan Brown – Director of Planning and Zoning, Waupaca County
- Dave Barnick – Chairperson, Town of Dupont

- Judy Suhs – Clerk, Town of Dayton
- Caz R. Muske – Administrator, City of Clintonville
- Dr. Melanie Oppor – District Administrator,
- Josh Werner – IT & Community Media Director, Waupaca
- Kris Peterson – Director of Sales, Bug Tussel Wireless
- Mitchel Olson
- Nathan Papendorf – Marion School District
- Ray Przekurat – Administrator, Iola-Scandinavia School District
- Robert Brown – Town of Dupont
- Ron Saari – Superintendent, Waupaca School District

Waushara County (September 30, October 28, 2021)

- Barry West, Information Systems Coordinator, Waushara County
- Jerry Schneider – CEO, Marquette-Adams Telephone
- Steve Schneider – CEO, Bug Tussel Wireless
- Jason Noska – Union Telephone
- Tommy Bohler – Administrator, City of Wautoma
- Eric Highlander – Technology Director, Wautoma Area School District
- Katie Reinbold – Town of Aurora
- Craig Hayes – Administrator Wild Rose School District
- Norman Duesterhoeft – Director of Emergency Management, Marquette County
- Keri Solis – Coordinator, Marquette County ED and Tourism

Winnebago County (October 1, October 29, 2021)

- Tricia Rathermel – Greater Oshkosh Development Corp
- Barb Van Clake – City of Omro
- Mike Hill – Government Affairs Manager, Charter Communications
- Celeste Flynn – Director of Government Affairs, Charter Communications
- John Welton – Spectrum/Charter Sales Manager, Charter Communications
- Maggie Starr – Town of Vinland Deputy Clerk/Treasurer
- Ryan Prellwitz – Vines and Rushes Winery
- Adam Rashka – Senior Director State Government Affairs, Charter Communications
- Adam Dorn, GIS Administrator, Winnebago County
- Patty Francour – Director of Information Systems, Winnebago County
- Mary Pfeiffer – Superintendent, Neenah Joint School District
- Ethan Hollenberger – County Executive, Winnebago County

- Chad Gehrke – Technology Director, School District of Omro
- About 5 other attendees at the 10/1 meeting