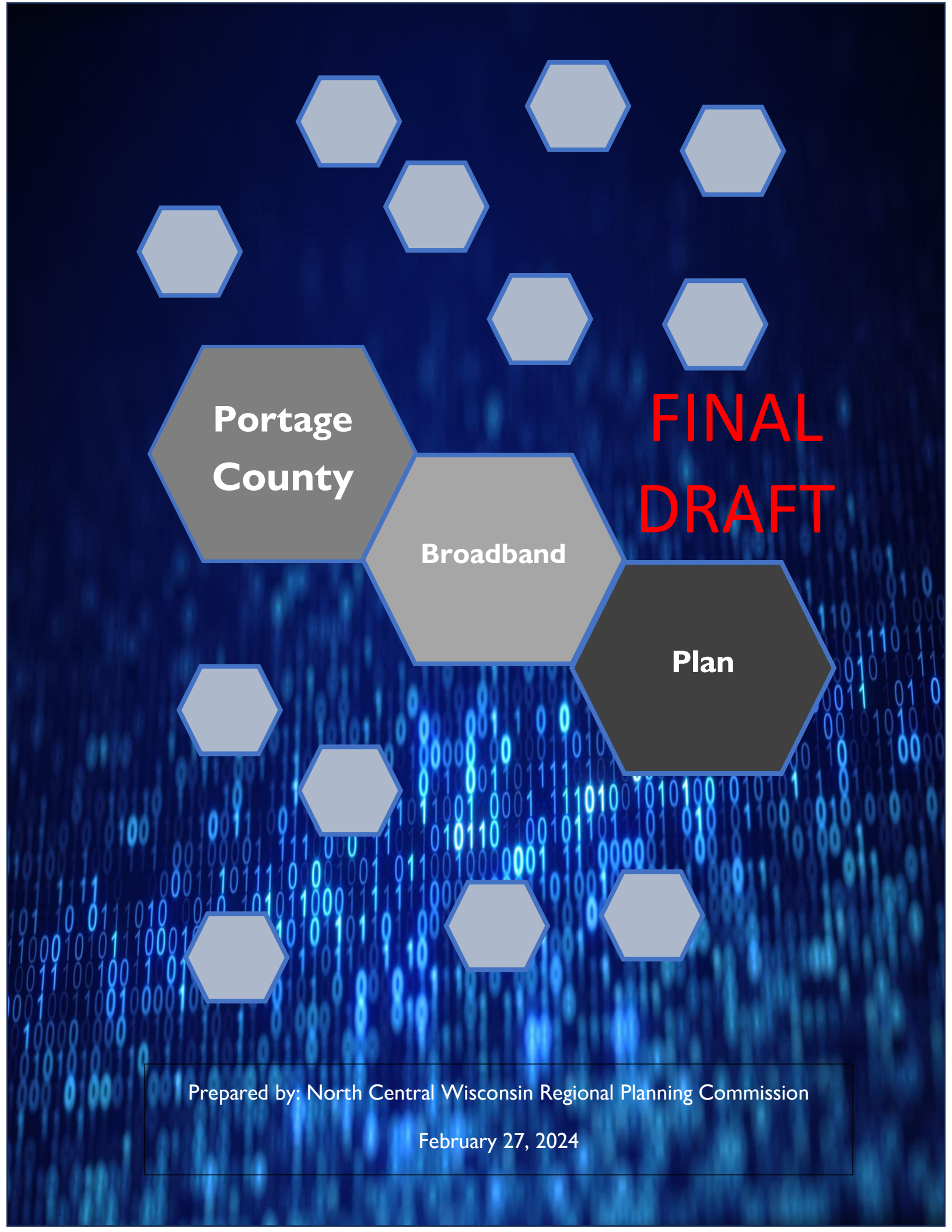

Prepared by: North Central Wisconsin Regional Planning Commission

February 27, 2024

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CHAPTER 1

Background

1. BACKGROUND

Broadband is essential in today's world. Every segment of the population, businesses, and government rely on the integration of the internet. For Portage County to remain competitive, it needs to both expand and improve broadband throughout the county. Both the state and federal governments have established a grant program to help promote the adoption of broadband across unserved and underserved areas.

The Broadband Equity, Access, and Deployment (BEAD) Program will provide $42.45 billion for expanding high-speed internet access by funding planning, infrastructure deployment, and adoption programs in all 50 states. Wisconsin's allocation of BEAD funding is just over $1 billion. To qualify for this funding, local entities must engage in broadband planning to gain insight into each community's vision for broadband development. These local plans may include outreach initiatives, conducting local needs assessment, and developing local or regional broadband plans. Ultimately, these local broadband planning activities will inform the state Five-Year Action Plan which will guide broadband deployment and implementation of the BEAD program.

The broadband plan outlined is a comprehensive strategy designed to bridge the digital divide by increasing connectivity and accessibility of broadband in Portage County. Further, this plan will identify both barriers and goals to infrastructure expansion and broadband adoption. As a result, Portage County will be better positioned to apply and hopefully receive BEAD funding for broadband deployment.

PURPOSE

The objective of the Broadband Plan is to offer insights into the current state of broadband deployment in Portage County. The information presented in this plan aims to help the county understand broadband, thus assisting local officials in making well-informed decisions in supporting the right broadband deployments. The plan is to help facilitate the optimal broadband connections to residents, taking into consideration the cost associated with these deployments. Access to quality and affordable high-speed internet opens new opportunities for economic development, education, public safety, entertainment, and healthcare for Portage County

PREVIOUS REGIONAL EFFORTS

The North Central Wisconsin Regional Planning Commission has identified Broadband as a foundational pillar critical to a strong economic recovery and increasing economic resilience in the North Central Wisconsin Regional Recovery Plan. This plan acknowledges Covid-19 magnified the significance of broadband access and the quick shift to a virtual world created significant disadvantages for businesses, workers, and residents alike. Additionally, this plan sought to expand broadband infrastructure and increase both the affordability and performance of broadband.

Specifically, this plan highlighted that most of the North Central Wisconsin Regional area geographically remains unserved or underserved for broadband access, with the exception being more urbanized areas. Throughout the Region overall, about 62 percent of households have broadband access. Therefore, the most significant consideration is the establishment of needed infrastructure throughout the Region to allow residents to access broadband. This Plan also recommends an examination of a multitude of factors that influence broadband adoption, including household income, educational attainment, age, and employment status. Other important considerations include the rural digital divide, cost, and digital literacy.

The following **goals** have been identified to be most important to the vision of the broadband future of the Region. Top considerations included successfully expanding broadband access to residences, businesses, and institutions throughout the Region, fostering quality broadband service that meets the needs of residences, businesses, and institutions throughout the region, and optimizing digital inclusion, digital literacy, and competitive costs.

Regional Goals

- Create universal broadband infrastructure throughout the Region.
- Bring high-performance broadband service throughout the Region.
- Make broadband affordable and competitive.
- Advance digital literacy and inclusion.

PLANNING PROCESS

The planning process for this initiative examined essential background information and data, facilitated the development of broadband deployment, and proposed adoption strategies. To ensure a comprehensive and locally informed approach, the county established a dedicated committee tasked with overseeing the planning process, offering valuable local insights, and ensuring effective oversight.

The process involved documenting broadband objectives from both regional and local perspectives. Furthermore, it entailed a thorough mapping of the existing state of broadband infrastructure, including pinpointing areas of high demand. This mapping exercise will help pinpoint coverage gaps and areas requiring substantial improvements.

In addition to these steps, the initiative involved the identification of potential barriers to broadband expansion and explored various funding options. Detailed cost estimates for infrastructure deployment were also generated. These efforts collectively aim to provide the county with valuable guidance, enabling them to engage with local Internet Service Providers (ISPs) effectively and advance their broadband access goals.

Portage County's Broadband Committee consulted with the North Central Wisconsin Regional Planning Commission (NCWRPC) at three meetings during the planning process. The first meeting on July 11, established the plan's timeline, and next steps, and NCWRPC shared information on the broadband speed test being conducted. The second meeting on September 19, was an opportunity to discuss and review the draft plan format as well as formalize the goals of the Plan. The final meeting included a final review of the plan by the committee before the adoption of the Broadband Plan.

BROADBAND COMMITTEE

Portage County has established an ad hoc Broadband Committee comprised of various county staff members. The committee's objective is to collect data for identifying ideal projects, securing grant funds, and engaging with Internet Service Providers (ISPs) to collaborate on ensuring the widespread availability of high-speed broadband across the county.

CHAPTER 2

Broadband: What It Is and Why It Matters

2. BROADBAND: WHAT IT IS AND WHY IT MATTERS

INTRODUCTION

Broadband accessibility has become a requirement, and not just a luxury for communities, businesses, workers, and residents in today's world. The benefits of broadband access and the drawbacks of a lack of access are quickly making broadband an essential utility. Broadband accessibility is a vital resource for businesses to operate and stay competitive in an increasingly digital economy. Broadband accessibility is also critical for residents, as those who lack access to high-speed internet have a harder time accessing jobs, healthcare, education, job and skills training, and other services.

For most Americans, broadband is commonplace in professional, personal, and social environments. Yet, broadband is the country's most inequitable infrastructure with around 15% of households not having subscriptions to any form of "broadband" internet service. Many residents and businesses in Portage County do not have access to adequate broadband, while others have no access to broadband at all, and are thus not able to use broadband internet service, putting them at a disadvantage as the world's reliance on the internet grows.

WHAT IS BROADBAND?

Broadband is the provision of a high-speed connection to the internet via the transmission of data through wide bandwidths, allowing for multiple signals to be transferred at once, as opposed to dated dial-up technology where only a single-line of data can be transferred. Broadband internet access is always on and is faster than dial-up access. The Federal Communications Commission (FCC) defines broadband as any of the following high-speed technologies: fiber, cable, fixed wireless, or satellite.

The standard for reliable broadband internet access is defined by the FCC as internet access with a download speed of 25 Mbps and an upload speed of 3 Mbps. Generally, these speeds are the minimum speeds where video streaming and a few in-home devices can work simultaneously. However, higher internet speeds are becoming increasingly important as broadband demand and data traffic rates continue to increase.

BENEFITS OF BROADBAND CONNECTIVITY

- **Economic Development**

  Broadband connectivity enables communities to develop, attract, retain, and expand job-creating businesses. Without reliable access to broadband, businesses and workers will likely be located where there is broadband.

- **Education**

  Broadband access provides students and educators with vast amounts of educational resources, enables online/remote education, and facilitates real-time collaboration and communication.

- **Healthcare**

  Broadband plays a crucial role in transforming healthcare and offers numerous benefits to patients and healthcare providers. Broadband enables telemedicine and remote consultations with doctors which is particularly valuable for patients in rural or underserved areas.

- **Public Safety**

  Broadband connectivity greatly enhances public safety by enabling faster communication among first responders and emergency services during emergencies. Broadband also allows for the deployment of video surveillance and monitoring in public spaces along with enabling emergency alerts through various digital channels.

- **Entertainment**

  Broadband has enhanced entertainment by offering high-quality streaming, on-demand content, social media engagement, online gaming, and much more.

TYPES OF INTERNET CONNECTIONS

Digital Subscriber Line (DSL): Transmits data over already available traditional copper telephone lines. DSL is good for light internet use but is not recommended for activities that require significant speed like video streaming.

Cable Modem: provides broadband through the same cables that generate sounds and pictures to a cable tv set. Cable internet usually provides reliable speeds but is not available in all areas.

Fiber-Optic: coverts electrical signals carrying data to light and sends the light through transparent glass fibers. Fiber transmits data at speeds far exceeding current DSL or cable modem speeds, typically by tens or even hundreds of Mbps. Currently, availability is limited, and it is costly to install.

Fixed Wireless: connects a home or business to the internet through a radio link between the customer's location and the internet service provider. Often used in rural areas and speeds are comparable to DSL or cable modem.

Mobile Wireless: relies on a cellular network to provide internet access to devices like smartphones and tablets.

Satellite: Another form of wireless internet from satellites orbiting the earth that can be useful in serving sparsely populated areas. It must have a good line-of-sight, but speeds are slower and there can be high installation costs.
Source: Federal Communications Commission

HOW FAST SHOULD BROADBAND BE?

The Federal Communications Commission (FCC) broadband capability requires consumers to have access to actual download speeds of at least 25 Mbps and actual upload speeds of at least 3 Mbps to be considered unserved locations. For grant funding, The Public Service Commission of Wisconsin will target businesses lacking 25 Mbps download and 3 Mbps upload. Underserved locations are those that do not have access to at least 100/20 Mbps.

Typical Internet Speeds

Speed	Number of users/devices	Tasks
5 Mbps	*1-2*	Online browsing, email, and research
25 Mbps	*3-5*	Downloading large files, business communications, and basic business Wi-Fi use
75 Mbps	*5-10*	Video streaming, numerous point-of-sale transactions, and frequent file-sharing
150 Mbps	*10-15*	Video conferencing, frequent cloud computing, and data backups
250 Mbps	*15-20*	Seamless streaming, conferencing, and server hosting
500 Mbps	*20-30*	Multiple servers hosted, heavy online backups, and constant cloud-based computing
1 GB	*30 +*	Extreme speed operations with zero interruptions

Source: Business.com

Portage County's goal is to have internet speeds of 100 Mbps download and 100 Mbps upload county-wide.

WISCONSIN SPEED TEST COLLECTION

In a partnership with the North Central Wisconsin Regional Planning Commission (NCWRPC) Wisconsin Economic Development Corporation (WEDC) and the Wisconsin Public Service Commission (PSC), a statewide internet speed testing application was secured to help collect locations, estimate cost, and upload/download speeds. The public can also note if they have no service or cannot afford service at their location. This application is a crowdsource data collection application. Counties and municipalities need to promote the speed test application to get enough tests to analyze the results. Portage County currently has 440 total tests at test locations and a participation rate of 1.05 percent. Tests can be taken, and results reviewed at www.wisconsinspeedtest.net.

Wisconsin Speed Test Map

Print this page

Portage County

Households	30,006
Population	70,008
Test locations	316
Total Tests	440
Percent participation	1.05%
Participation goal (10%)	3,001

Download

• No Service	4	1.3%
•0-25 Mbps	82	25.9%
•25-11 Mbps	100	31.6%
•100+ Mbps	130	41.1%

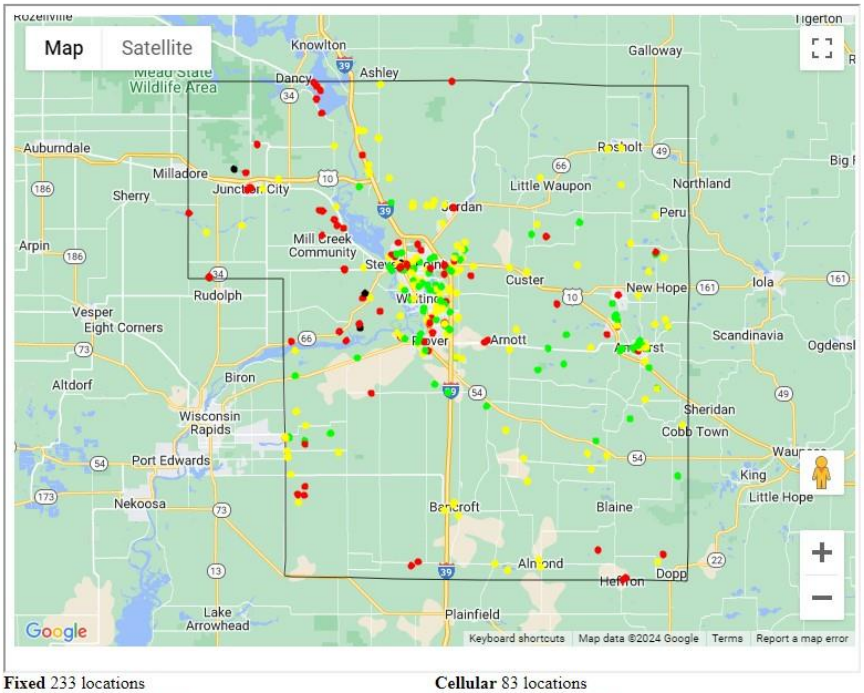
Upload

No Service	4	1.3%
<3 Mbps	61	19.3%
3-25 Mbps	141	44.6%
25-100 Mbps	68	21.5%
100+ Mbps	41	13.0%

	Min Max	Med Mbps
Download	0.21 860.17	82.92
Upload	0.08 923.74	11.54

No service reasons: may total>100%

Too Expensive	33.33%
Not Available	100.00%
Don't Know How Internet	33.33%
Physical Issues	33.33%



Fixed 233 locations

Download			Upload		
No Service	4	1.7%	No Service	4	1.7%
0-25 Mbps	60	25.8%	<3 Mbps	44	18.9%
25-100 Mbps	84	36.1%	3-25 Mbps	126	54.1%
100+ Mbps	85	36.5%	25-100 Mbps	29	12.4%
			100+ Mbps	30	12.9%

Cellular 83 locations

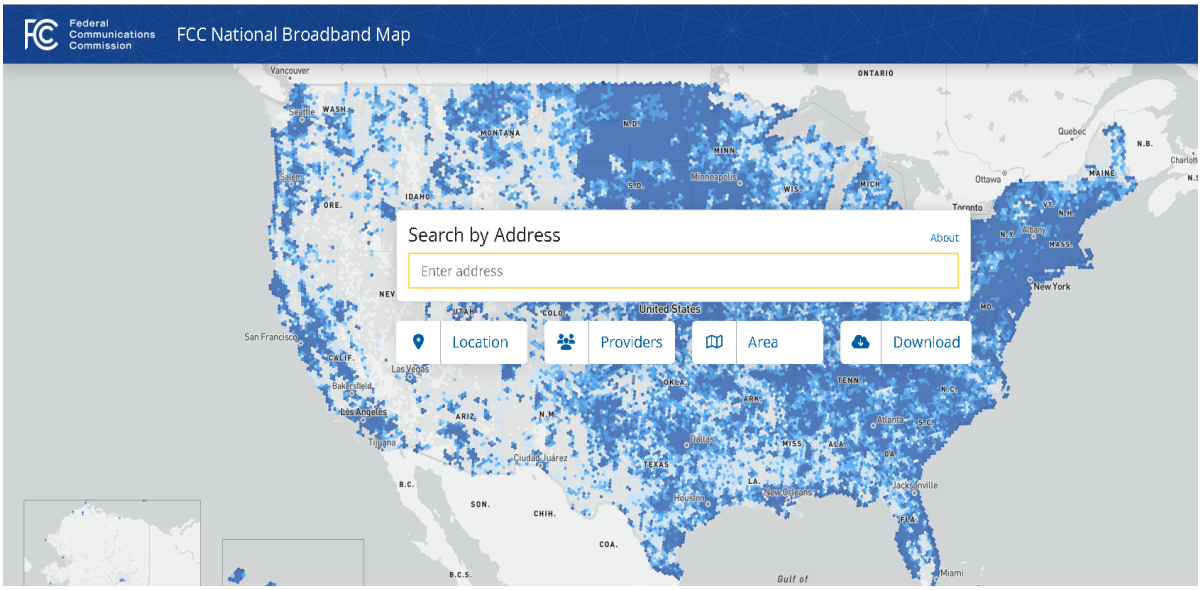
Download			Upload		
0-25 Mbps	22	26.5%	<3 Mbps	17	20.5%
25-100 Mbps	16	19.3%	3-25 Mbps	6	7.2%
100+ Mbps	45	54.2%	25-100 Mbps	9	10.8%
			100+ Mbps	43	51.8%

NATIONAL BROADBAND MAP

In November of 2022, the FCC released a pre-production draft of its new National Broadband Map. This map was the first of its kind, showing address-level broadband coverage data for homes and businesses in the nation. Previously, the FCC had mapped broadband coverage data as reported by the census block. This led to the overstatement of broadband coverage and inaccuracies in the map. The new map displays fixed and mobile broadband availability in the United States and allows users to search by address, view provider coverage areas, display location and area summaries, download the data, and more. The map also allows users to filter by data vintage, residential vs. business service, technology type, and speed.

A recent update to the map was released in May of 2023 and incorporated millions of availability and location challenges from the public, state, local, and Tribal governments nationwide. Challenges to the map are a critical mechanism to create the most accurate and up-to-date map possible. Location challenges allowed users, where appropriate, to challenge that an address was either incorrectly located, missing, an incorrect unit count, not contained within the correct building footprint, not broadband serviceable, or the wrong building type. Availability challenges

allowed users to challenge that a provider was incorrectly reported at an address for reasons such as the provider requested more than the standard installation fee to connect service, failed to schedule a service installation within 10 business days of request, denied a request for service, or did not offer the technology reported to be available. As a result of other advancements and the challenge process, the National Broadband Map will continue to improve and be updated twice a year.



CHAPTER 3

Portage County Community Profile

3. PORTAGE COUNTY COMMUNITY PROFILE

PURPOSE

Demographics play a critical role in broadband planning by offering insights that guide strategic decisions. They enable targeted investment by identifying areas with high demand for broadband services, ensuring efficient allocation of resources. Demographic data also helps address inequalities in access and connectivity across various segments of the population. By estimating demand and usage patterns, planners can design networks that cater to specific needs. This customization extends to business development, education, and digital inclusion efforts, fostering economic growth and bridging societal gaps.

GENERAL POPULATION

Population growth has slowed at the state level and the county level over the past two decades. In the 1990s, the County grew at 9.3 percent while the state grew at 4.0 percent. In 2010, Portage County had a total population of 69,437 residents. By 2021, 70,378 persons resided in the County, which is a 1.4 percent increase from the 2010 census total. Overall, Portage County's population increased by 4.8 percent between 2000 and 2020. In comparison, the state's population grew by 9.9 percent between 2000 and 2020, with a 3.6 percent increase between 2010 and 2020.

Understanding the population of an area provides insights into the potential user base for broadband services. Higher population density often correlates with greater demand for internet access, making it important to allocate resources to meet this demand effectively. Moreover, population distribution across urban and rural areas influences the deployment strategy, as densely populated urban centers may require different infrastructure solutions compared to sparsely populated rural regions. Additionally, the size of the population affects the economic viability of broadband projects.

Table 3-1 displays the total population for each minor civil division, the county, and the state. 16 out of the 27 municipalities in Portage County lost population from 2010 to 2021. During this time, the City of Stevens Point saw the largest net decrease, losing 730 people. At the same time, the Town of Almond experienced the largest percentage decrease, at 28.5 percent. The Village of Plover had the largest net increase, adding 1,605 people, with the Town of Lanark's population growing 16 percent. Not reflected in the population numbers is the seasonal population.

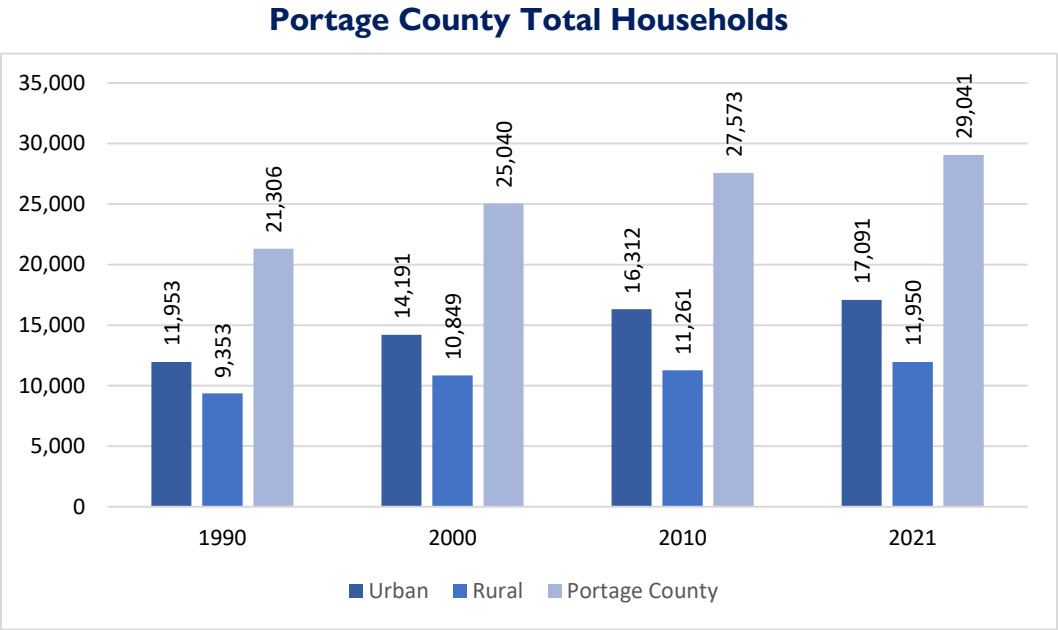
Table 3-1 Portage County Population								
Minor Civil Division	1990	2000	2010	2021	1990-2010 % Change	1990-2010 Net Change	2010-2021 % Change	2010-2021 Net Change
C. Stevens Point	23,006	24,492	26,482	25,752	15.1%	3,476	-2.8%	-730
V. Plover	8,176	10,520	11,830	13,435	44.7%	3,654	13.6%	1,605
V. Whiting	1,838	1,760	1,598	1,535	-13.1%	-240	-3.9%	-63
V. Park Ridge	546	488	473	461	-13.4%	-73	-2.5%	-12
Urban Area	**33,566**	**37,260**	**40,383**	**41,183**	**20.3%**	**6,817**	**2.0%**	**800**
V. Almond	455	459	441	441	-3.1%	-14	0.0%	0
V. Amherst	792	964	1,031	1,015	30.2%	239	-1.6%	-16
V. Amherst Jct.	269	305	297	291	10.4%	28	-2.0%	-6
V. Junction City	502	440	418	382	-16.7%	-84	-8.6%	-36
V. Nelsonville	171	191	230	193	34.5%	59	-16.1%	-37
V. Rosholt	512	518	436	463	-14.8%	-76	6.2%	27
T. Alban	860	897	758	820	-11.9%	-102	8.2%	62
T. Almond	590	679	727	520	23.2%	137	-28.5%	-207
T. Amherst	1,335	1,435	1,361	1,450	1.9%	26	6.5%	89
T. Belmont	540	623	604	602	11.9%	64	-0.3%	-2
T. Buena Vista	1,170	1,187	1,196	1,161	2.2%	26	-2.9%	-35
T. Carson	1,327	1,299	1,153	1,293	-13.1%	-174	12.1%	140
T. Dewey	849	975	1,060	1,172	24.9%	211	10.6%	112
T. Eau Pleine	944	931	890	938	-5.7%	-54	5.4%	48
T. Grant	1,673	2,020	1,712	1,968	2.3%	39	15.0%	256
T. Hull	5,559	5,493	5,323	5,294	-4.2%	-236	-0.5%	-29
T. Lanark	1,154	1,449	1,539	1,785	33.4%	385	16.0%	246
T. Linwood	1,035	1,111	1,387	1,162	34.0%	352	-16.2%	-225
T. New Hope	694	736	709	656	2.2%	15	-7.5%	-53
T. Pine Grove	949	904	1,045	1,037	10.1%	96	-0.8%	-8
T. Plover	2,223	2,415	1,778	1,558	-20.0%	-445	-12.4%	-220
T. Sharon	1,742	1,936	2,045	1,986	17.4%	303	-2.9%	-59
T. Stockton	2,494	2,896	2,914	3,008	16.8%	420	3.2%	94
Rural Area	**27,839**	**29,863**	**29,054**	**29,195**	**4.4%**	**1,215**	**0.5%**	**141**
Portage Co.	**61,405**	**67,123**	**69,437**	**70,378**	**13.1%**	**8,032**	**1.4%**	**941**
Wisconsin	**4,891,769**	**5,363,675**	**5,637,947**	**5,895,908**	**15.3%**	**746,178**	**4.6%**	**257,961**

Source: US Census Bureau

HOUSEHOLDS

Understanding the number of households is of significant importance in broadband planning, as it influences the scope of infrastructure deployment, service coverage, resource allocation, financial viability, and equitable access.

In 2021, there were 21,041 households in Portage County following at least three decades of household growth. The early 2000s saw a 10 percent increase in the number of households. Between 2010 and 2020, the number of households grew 5.3 percent. Generally, the number of households across the country has been increasing as more people decide to live alone and more couples have fewer children or no children at all for several decades.



YEAR-ROUND AND SEASONAL HOUSING

Table 3-2 displays the percentage of seasonal and year-round housing in the County. Not reflected in the population numbers is the seasonal population. In 2020, 1.5 percent of housing units were seasonal housing.

The county has some tourist destinations and popular vacation home areas. While an insignificant number, the summertime population places an increased demand on county and local government resources and should be considered in the broadband planning process.

Table 3-2: Portage County Seasonal and Year-Round Population		
Minor Civil Division	**Seasonal**	**Year-round**
C. Stevens Point	0.4%	94.6%
V. Plover	0.6%	96.3%
V. Whiting	0.0%	94.6%
V. Park Ridge	0.0%	98.3%
V. Almond	0.0%	88.9%
V. Amherst	0.0%	94.4%
V. Amherst Jct.	0.0%	92.9%
V. Junction City	0.0%	80.6%
V. Nelsonville	0.5%	93.4%
V. Rosholt	0.0%	84.6%
T. Alban	3.2%	86.9%
T. Almond	26.8%	73.0%
T. Amherst	8.8%	93.5%
T. Belmont	5.4%	90.6%
T. Buena Vista	16.1%	79.3%
T. Carson	7.5%	91.5%
T. Dewey	2.6%	93.6%
T. Eau Pleine	3.1%	92.5%
T. Grant	15.1%	84.9%
T. Hull	0.0%	96.4%
T. Lanark	0.0%	95.6%
T. Linwood	6.4%	84.6%
T. New Hope	4.0%	94.8%
T. Pine Grove	6.5%	84.2%
T. Plover	2.6%	91.0%
T. Sharon	4.5%	91.7%
T. Stockton	6.1%	90.2%
Portage County	1.5%	93.5%
State	7.1%	87.8%

Source: US Census Bureau

BROADBAND SERVICEABLE LOCATIONS (BSL)

Broadband Serviceable Locations (BSL) were estimated using Portage County tax parcels. Points were created for each parcel with an improvement value that was counted as a BSL. Table 3-3 summarizes the BSL by minor civil division.

Table 3-3: Broadband Serviceable Locations

Minor Civil Division	BSL	BSL per SQMI	SQMI
City of Stevens Point	6884	471.1	14.6
Village of Almond	199	193.2	1.0
Village of Amherst	441	368.7	1.2
Village of Amherst Junction	133	123.2	1.1
Village of Junction City	170	142.8	1.2
Village of Milladore	5	1223.5	0.0
Village of Nelsonville	100	95.8	1.0
Village of Park Ridge	224	1026.4	0.2
Village of Plover	3647	448.2	8.1
Village of Rosholt	208	190.1	1.1
Village of Whiting	549	259.2	2.1
Town of Alban	626	17.3	36.1
Town of Almond	362	8.4	43.2
Town of Amherst	734	19.0	38.6
Town of Belmont	447	12.3	36.2
Town of Buena Vista	632	10.3	61.2
Town of Carson	640	11.6	55.0
Town of Dewey	484	10.3	47.0
Town of Eau Pleine	519	9.0	57.6
Town of Grant	1114	15.6	71.2
Town of Hull	2533	77.5	32.7
Town of Lanark	768	21.3	36.0
Town of Linwood	528	15.6	33.8
Town of New Hope	436	12.0	36.3
Town of Pine Grove	407	10.8	37.8
Town of Plover	1611	35.7	45.1
Town of Sharon	1007	15.5	64.9
Town of Stockton	1379	23.9	57.8

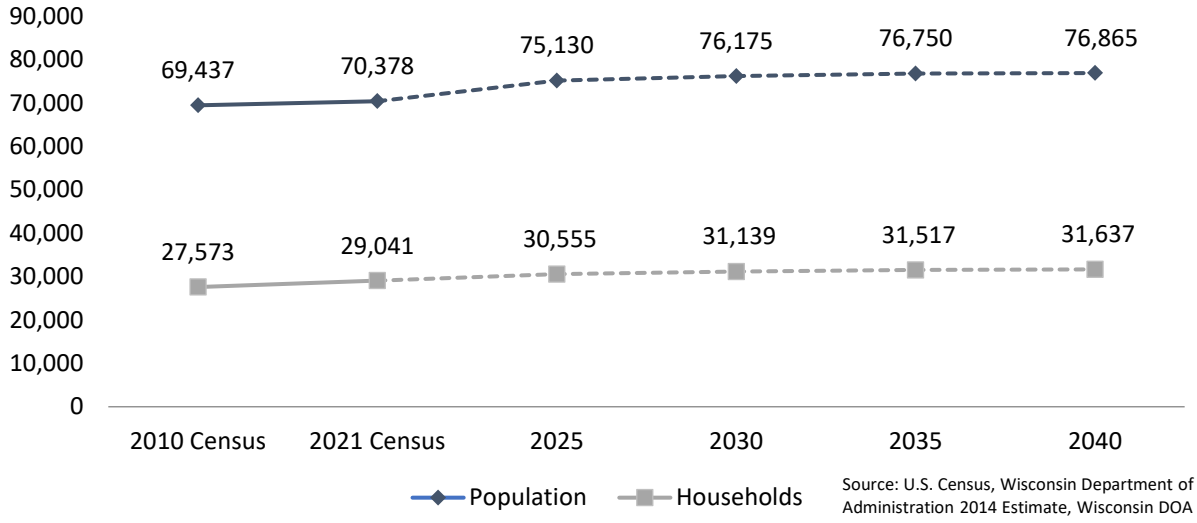
Source: NCWRPC and Portage County GIS

PORTAGE POPULATION AND HOUSEHOLD PROJECTIONS

Figure 3-1 shows the population and household future projections for Portage County. Despite slow population growth over the last decade, the County is expected to grow by 8.2 percent over the next 10 years. The County's population will continue to grow in the following decade (2030-2040) by 0.9 percent.

The number of households in the County is projected to increase by 7.2 percent between 2021 and 2030. The number of households is expected to continue to grow by 1.6 percent between 2030 and 2040.

Figure 3-1: Portage County Population and Household Change



Source: U.S. Census, Wisconsin Department of Administration 2014 Estimate, Wisconsin DOA

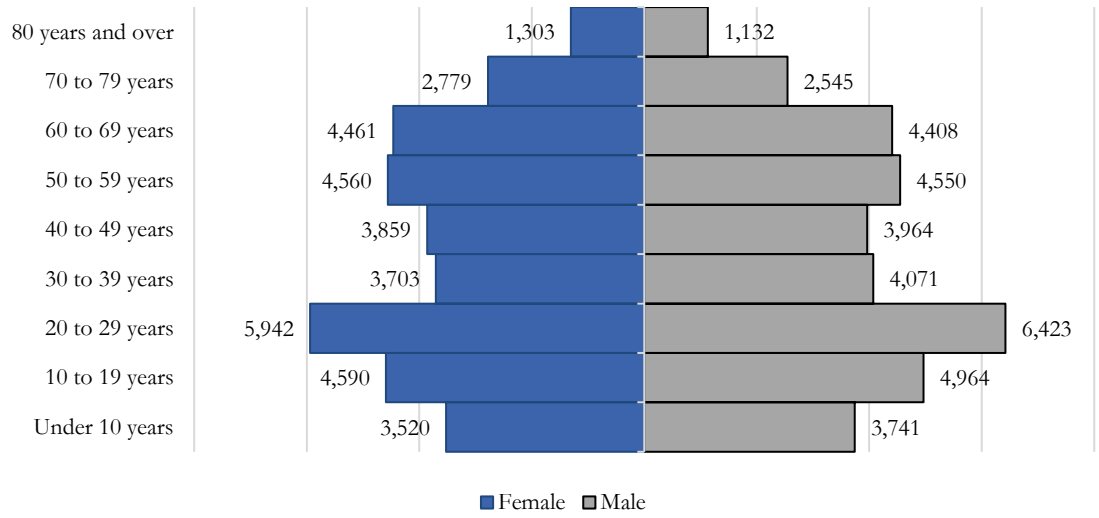
AGE DISTRIBUTION

Population distribution is important to the planning process. In particular, understanding and considering age-related factors will better ensure that broadband services will effectively meet the needs of all community members, regardless of age. Factors like tailoring infrastructure for different age groups based on varying needs and preferences are important. For example, communities with a significant number of elderly residents might have a need for services like telemedicine. Age distribution can also provide insights into broadband adoption and usage patterns. Understanding the adoption of broadband by age group can help determine where resource allocation is most appropriate.

Like many counties in Wisconsin, Portage County has a strong baby-boom generation presence but a robust 20–29-year-old cohort. At the same time, the County's median age is lower than the State's. In 2010, the median age in Portage County was 36.1 years old, compared to 38.1 for the state. By 2020, the median age in the county increased to 38.5 years old, compared to 39.6 for the state. Furthermore, the percentage of the county's population 60 years old or older is increasing. In 2010, 17.2 percent of the county's total population was 60 years old or older. By 2020, 23.6 percent of the county population was 60 years old or older. Comparatively, the state's share of the population 60 years or older increased from 18.4 in 2010 to 23.6 percent of the population in 2020. It is believed that this age demographic has been slower adopters of broadband and internet usage more generally.

At the same time, Portage County has a large share of the population between the ages of 10 and 29 years old. In 2021, 13.6 percent of the County population is between the ages of 10-19 years old, compared to 13.1 percent for the state. As for the 20–29-year-old population, 16.6 percent of the County population is between these ages, compared to 12.9 percent for the state. Similar to the senior citizen population, this younger age cohort has technological needs, and many younger people rely heavily on having reliable internet access for school or connecting with their peers online. Students at local school districts and area colleges like the University of Wisconsin-Stevens Point rely on the internet for online learning and without reliable broadband, many students could be left behind.

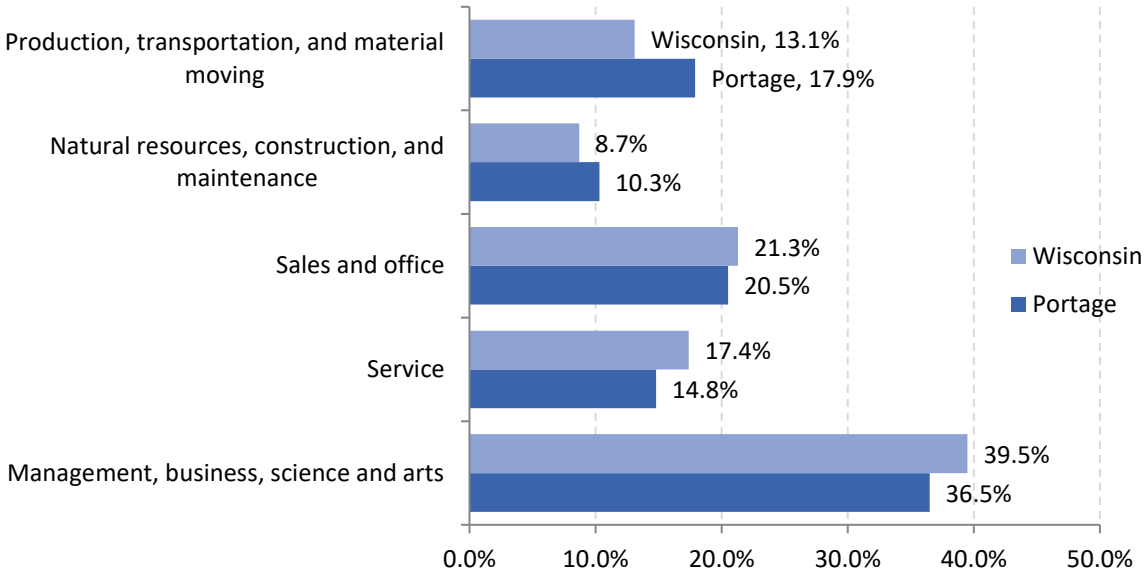
Figure 3-2: 2021 Portage County Age-Sex Pyramid



EMPLOYMENT

In 2021, there were 38,319 residents employed. (Note that these are persons employed and many work outside the county.) This reflected a 5.3 percent increase in the county's employment since 2010, compared to a 3.9 percent growth for the state. Prominent resident occupational categories in the county include the management, business, science, and arts category as well as the sales and office category. The occupations related to the production, transportation, and material moving category are a larger share for the county than the state.

Figure 3-3 Portage County Resident Occupation



Source: American Community Survey, 2016-2020

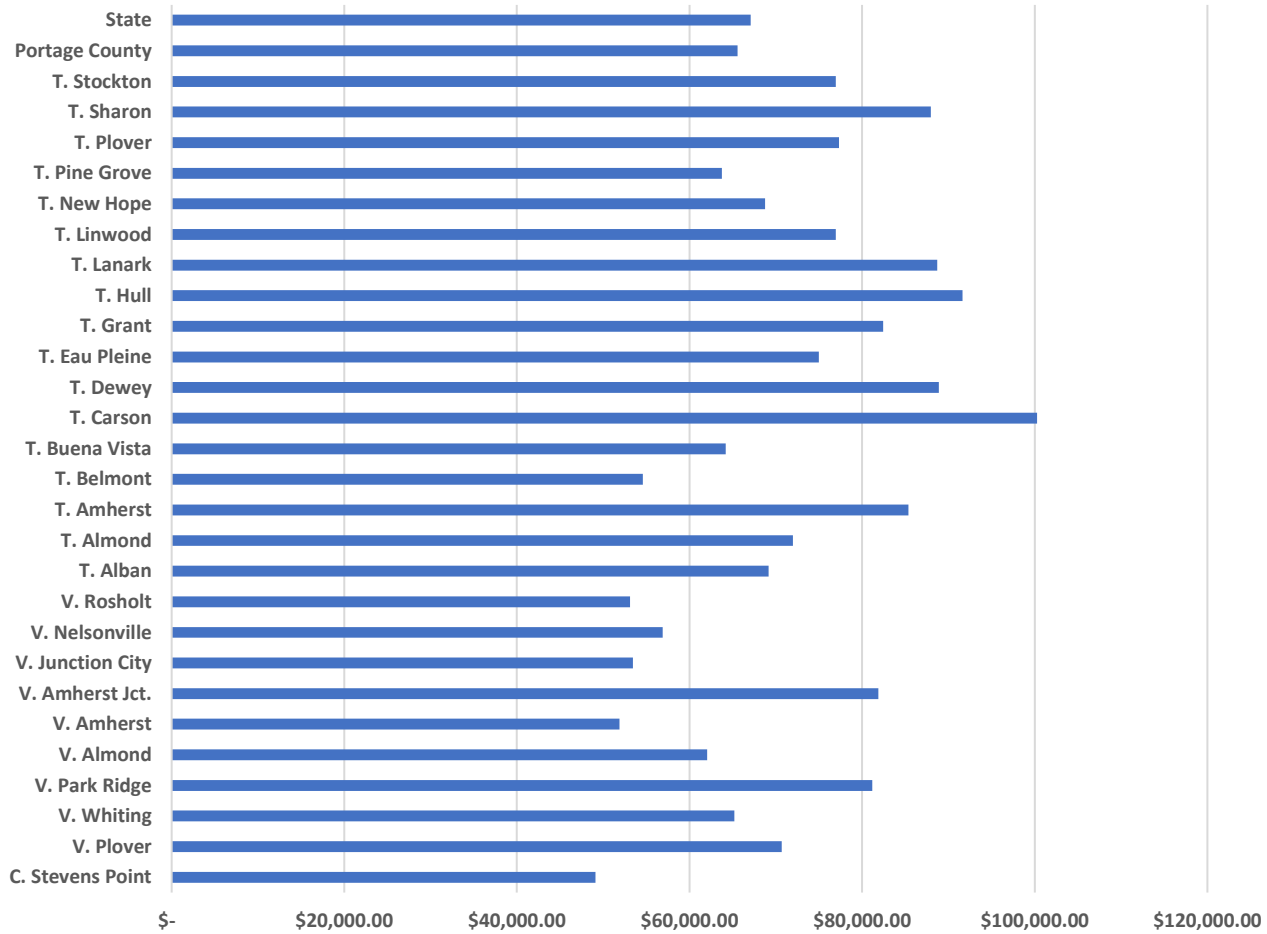
Gaining insight into the economic conditions of the county can provide valuable information regarding the prospects for enhancing broadband services. As reflected in figure 3-3, occupations like management, business, science, and arts and sales and office occupations are prominent occupations and likely rely on the internet regularly to do business. These businesses in the county should be further engaged to understand the specific needs and demands for internet access.

INCOME

Income levels are important in broadband planning due to their impact on affordability, digital inclusion, and the overall effectiveness of broadband initiatives. Median household income is displayed in figure 3-4. The county median household income rose about 27.4 percent between 2010 and 2021, compared to a state increase of 30 percent. Meanwhile, the county per capita income increased by 40.1 percent, compared to the state increase of 38.0 percent.

When incomes are adjusted for inflation, it is apparent that household incomes have kept up with and surpassed inflation. Had the 2010 County median household income risen with the Consumer Price Index, it would have been $62,117 in 2020, less than the actual $65,550 for 2020. The municipalities with the highest median household income include the towns of Carson, Hull, and Sharon. The lowest median incomes include Stevens Point, Amherst, and Rosholt. Overall, the total county median income is lower than the state level, but per capita income is higher than the state level.

Figure 3-4 Portage County Median Household Income



CHAPTER 4

Current Broadband Assessment of Portage County

4. CURRENT BROADBAND ASSESSMENT OF PORTAGE COUNTY

This section primarily provides an overview of the current state of broadband supply (available broadband services) in Portage County from readily available sources. This section is supplemented by the Wisconsin Speed Test (M-Lab), American Community Survey Data, and FCC form 477 data.

Broadband adoption is typically measured in the percentage of households that subscribe to home broadband internet service. Broadband internet includes internet via cable, fiber optic, wireless or DSL service. On the other hand, wireless internet (ex. Mobile cellular service), is typically not considered broadband, yet many households only use mobile cellular service to connect to the internet.

WISCONSIN SPEED TEST COLLECTION

In a partnership with the North Central Wisconsin Regional Planning Commission (NCWRPC) Wisconsin Economic Development Corporation (WEDC) and the Wisconsin Public Service Commission (PSC), a statewide internet speed testing application was secured to help collect locations, estimate cost, and upload/download speeds. The public can also note if they have no service or cannot afford service at their location. This application is a crowdsource data collection application. Counties and municipalities need to promote the speed test application to get enough tests to analyze the results. Portage County currently has 316 total tests at 440 test locations and a participation rate of 1.05 percent. Due to this low participation rate, there is likely a high level of error in the speed test results. Tests can be taken, and results reviewed at www.wisconsinspeedtest.net.

Portage County Speed Test Map

Print this page

Portage County

Households	30,006
Population	70,008
Test locations	316
Total Tests	440
Percent participation	1.05%
Participation goal (10%)	3,001

Download

• No Service	4	1.3%
•0-25 Mbps	82	25.9%
•25-11 Mbps	100	31.6%
•100+ Mbps	130	41.1%

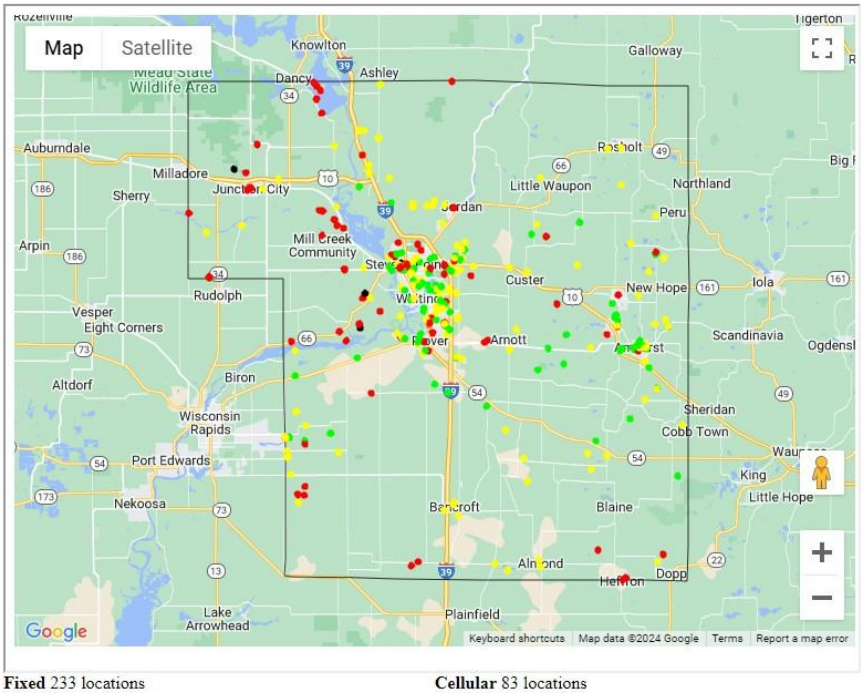
Upload

No Service	4	1.3%
<3 Mbps	61	19.3%
3-25 Mbps	141	44.6%
25-100 Mbps	68	21.5%
100+ Mbps	41	13.0%

	Min	Max	Med Mbps
Download	0.21	860.17	82.92
Upload	0.08	923.74	11.54

No service reasons: may total>100%

Too Expensive	33.33%
Not Available	100.00%
Don't Know How Internet	33.33%
Physical Issues	33.33%



Fixed 233 locations

Download			Upload		
No Service	4	1.7%	No Service	4	1.7%
0-25 Mbps	60	25.8%	<3 Mbps	44	18.9%
25-100 Mbps	84	36.1%	3-25 Mbps	126	54.1%
100+ Mbps	85	36.5%	25-100 Mbps	29	12.4%
			100+ Mbps	30	12.9%

Cellular 83 locations

Download			Upload		
0-25 Mbps	22	26.5%	<3 Mbps	17	20.5%
25-100 Mbps	16	19.3%	3-25 Mbps	6	7.2%
100+ Mbps	45	54.2%	25-100 Mbps	9	10.8%
			100+ Mbps	43	51.8%

Speed Test Results for Portage County

- The Portage County median (118 Mbps) is similar to the 2023 State median download speed of over 100 Mbps. Far exceeding the FCC's minimum standard to qualify as broadband (25 Mbps).

- Portage County and the entire State of Wisconsin's monthly median download speeds have been steadily increasing over the past several years.

- The difference between the State and Portage County in terms of monthly median upload speeds is also significant. Portage County's speeds were higher than those of the State in 2023 (54 Mbps vs. 15 Mbps). As a reminder, the FCC's current minimum upload standard for broadband is 3 Mbps.

- Due to the lack of speed tests in Portage County, these test results should be examined with caution.

Table 4-1 Wisconsin Speed Test Average Download and Upload Speeds		
Minor Civil Division	**Average Download Speeds (Mbps)**	**Average Upload Speeds (Mbps)**
C. Stevens Point	176.3	104.5
V. Plover	117.7	18.6
V. Whiting	246.5	121.3
V. Park Ridge	298.5	297.7
V. Almond	73.8	12.0
V. Amherst	30.5	5.6
V. Amherst Jct.	30.5	5.6
V. Junction City	12.5	0.8
V. Nelsonville	NA	NA
V. Rosholt	NA	NA
T. Alban	NA	NA
T. Almond	52.4	10.8
T. Amherst	130.8	16.7
T. Belmont	9.4	0.9
T. Buena Vista	87.2	9.9
T. Carson	46.5	33.7
T. Dewey	50.5	8.7
T. Eau Pleine	12.7	1.9
T. Grant	119.4	73.2
T. Hull	117.0	13.4
T. Lanark	126.6	21.0
T. Linwood	38.9	10.3
T. New Hope	60.3	28.9
T. Pine Grove	51.0	11.8
T. Plover	234.6	119.0
T. Sharon	25.3	2.9
T. Stockton	81.5	14.9
Portage County	118	54
State	68.7	16.8

Source: Wisconsin Speed Test (M-Lab), NCWRPC

AMERICAN COMMUNITY SURVEY

The U.S. Census Bureau's American Community Survey gathers information from households to understand broadband adoption. The 2017-2021 5-year American Community Survey revealed that 89.4 percent of households in Portage County have access to an internet subscription. A few rural municipalities have relatively low rates of broadband or internet subscriptions per household; with the Towns of Alban, Eau Pleine, and Villages of Whiting and Junction City having the lowest percentage of households with broadband access in the county. On the other hand, Amherst Junction and Park Ridge have at least 95 percent of households with internet access, and several other rural towns possess the highest broadband adoption rates in the county.

Approximately 79.2 percent of households within Portage County have a broadband subscription (cable, fiber optic, DSL, or satellite), not including cellular data plan service. While typically not as reliable or as fast as broadband, cellular data subscriptions, and more costly satellite internet services help fill the internet gap within the County by providing access to the internet for households without broadband subscriptions. Mobile data services are often required for households that cannot afford a broadband subscription, while both mobile data and satellite services are often required for those who do not live in an area where broadband service is readily available. The percentage of households with a cellular data plan and no other internet subscription in the county is 11.3 percent. There are seven municipalities with at least 20 percent only having access to the internet through a cellular data plan (i.e., cell phone service).

Comparatively, Portage County has a higher proportion of households than the state with access to broadband by about 6 percent. Additionally, the percentage of households with cellular data but no other internet plan is greater than the state by approximately 4 percent. The percentage of Portage County households with broadband access can also be compared to neighboring counties. Overall, more Portage County households have access to broadband than the surrounding counties. As mentioned, 89.4 percent of Portage County households have a broadband subscription. This is compared to 84.6 percent of Waupaca County households, 82.4 percent of Waushara County households, 86.1 percent of Wood County households, and 87.4 percent of Marathon County households having broadband.

In general, broadband adoption rates within the county are typically highest in and around population centers, and lowest in the more scarcely populated areas. This disparity in broadband adoption rates is partly due to differences in the availability of broadband in these areas, as broadband availability is much higher in more densely populated areas than in areas with low-density populations.

Table 4-2: Portage County Households with Internet		
Minor Civil Division	**% of Households with an Internet Subscription**	**% of Households with Cellular Data Plan, no other Internet Subscription**
C. Stevens Point	89.1%	9.9%
V. Plover	93.7%	8.7%
V. Whiting	82.0%	3.9%
V. Park Ridge	95.1%	6.9%
V. Almond	91.2%	9.9%
V. Amherst	86.7%	12.2%
V. Amherst Jct.	97.3%	20.7%
V. Junction City	82.3%	20.3%
V. Nelsonville	90.7%	6.7%
V. Rosholt	87.2%	16.7%
T. Alban	78.6%	10.9%
T. Almond	87.5%	22.6%
T. Amherst	93.1%	11.0%
T. Belmont	83.4%	23.0%
T. Buena Vista	82.9%	24.5%
T. Carson	88.0%	21.8%
T. Dewey	87.5%	21.9%
T. Eau Pleine	83.8%	15.1%
T. Grant	92.1%	10.0%
T. Hull	86.3%	7.4%
T. Lanark	93.2%	15.2%
T. Linwood	86.3%	28.6%
T. New Hope	84.3%	12.1%
T. Pine Grove	92.7%	19.6%
T. Plover	89.8%	17.9%
T. Sharon	84.2%	9.4%
T. Stockton	90.0%	12.0%
Portage County	89.4%	11.3%
State	86.9%	11.0%

Source: American Community Survey, 2017-2021

FEDERAL COMMUNICATIONS COMMISSION (FCC) FIXED BROADBAND DEPLOYMENT

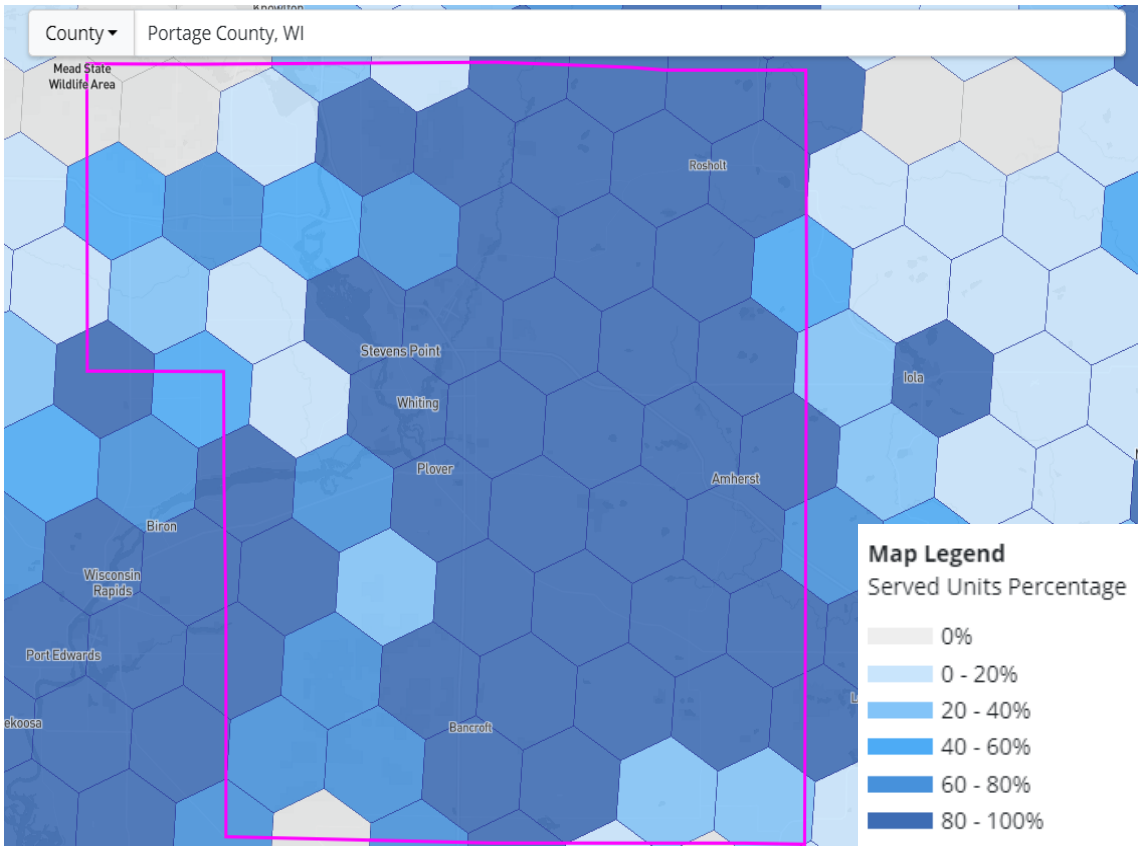
The data and National Broadband Map in this sub-section are primarily drawn from internet service provider (ISP) reporting to the Federal Communications Commission (FCC) via Form 477. All facilities-based ISPs are required to file data with the FCC twice a year (Form 477) where they offer Internet access service at speeds exceeding 200 kbps in at least one direction.

There are two important factors to remember about FCC Form 477 Reporting and "Advertised Speeds."

(1) Fixed providers file lists of census blocks in which they can or do offer internet service to at least one location. Rarely, some ISPs may provide more detailed mapping to the WBO. So, while a map may suggest that an entire census block has the reported broadband service available, this is often not the case and only one customer may be connected within that entire block. To confuse things further, on occasion, an ISP may only report those census blocks in which they have a franchise agreement with a municipality or are exclusively allowed to cover; they may also provide some service in an unreported area.

(2) ISPs report their "advertised speed." Actual speeds can be significantly lower. A 2020 Purdue study found that "on average, FCC advertised download speeds were 10.7 times higher than average [M-Lab] test speeds in the country compared to 7.4 times regarding upload speeds." The report also found that advertised speeds are closer to the speed test results in urban counties, while the gap in rural counties is larger. This is very important and justifies the need for studies such as this. Higher, inaccurate reported speeds may deter much needed investment, especially in rural areas such as parts of Portage County, if the State and Federal governments are basing policy and financial decisions on advertised speeds (and not actual speeds). As explained in the Purdue article and Section VI, actual speeds will differ for numerous reasons, including some factors not controlled by the ISPs, such as the choice of subscription plans by the end user.

ISP Advertised Speeds and Number of Broadband Providers to FCC



WISCONSIN DEPARTMENT OF PUBLIC INSTRUCTION (DPI) DATA

The Wisconsin Department of Public Instruction (DPI) has become a leader in internet/broadband data collection in recent years. DPI partners with local school districts and public libraries for data collection. The DPI Digital Equity Gap webpage (https://dpi.wi.gov/broadband) includes a variety of resources and DPI has partnered with M-Lab to collect data on internet connection speeds across Wisconsin.

The latest 2020-2021 Digital Equity Survey showed three of the four school districts in the county participated in the DPI survey on broadband. Specifically, DPI received data from the majority of school districts that have a large presence in Portage County. This survey revealed that the majority of students in the county have access to the internet at home (>95%). The primary reason why some homes lack internet access is the absence of internet availability in their area. At the same time, respondents indicated that the internet was less reliable to them at home, even if they had access to it (>15%). Further, the vast majority of respondents mentioned that they have issues with streaming on their primary device (>90%).

Table 4-3: DPI Portage County Digital Equity Findings-Access			
School District	**% of respondents without home internet**	**% of respondents without home internet due to affordability**	**% of respondents without home internet due to availability**
Almond-Bancroft School District	**10.1%**	**41.2%**	**52.9%**
Tomorrow River School District	**1.4%**	**50%**	**50%**
Stevens Point Area School District	**1%**	**12.7%**	**30.9%**
Wisconsin Rapids School District	**2.4%**	**31.1%**	**52.8%**
Source: Department of Public Instruction Digital Equity Survey, 2021-2022			

*No Data for Rosholt School District

Table 4-4: DPI Portage County Digital Equity Findings-Affordability			
School District	**% of respondents with partially or completely unreliable internet**	**% of respondents who cannot reliably stream video on primary device**	**% of respondents who have issues with quality or interruptions of the stream on primary device**
Almond-Bancroft School District	**30.3%**	**29%**	**71%**
Tomorrow River School District	**16.4%**	**4.5%**	**95.5%**
Stevens Point Area School District	**18.2%**	**5.6%**	**94.4%**
Wisconsin Rapids School District	**16.6%**	**12.8%**	**87.2%**
Source: Department of Public Instruction Digital Equity Survey, 2021-2022			

*No Data for Rosholt School District

OVERVIEW

The current broadband assessment in Portage County reveals that the county generally meets or exceeds broadband standards, with median download speeds surpassing FCC minimums. However, the data collection process faces challenges due to low participation rates, potentially impacting the accuracy of results. While broadband access is prevalent, some rural areas lag in adoption, relying on cellular data plans to bridge the gap. Discrepancies between advertised and actual speeds, particularly in rural regions, underscore the importance of making informed policy and investment decisions. The DPI data also highlights concerns about reliability and streaming quality, indicating the need for improvements in these areas to ensure robust internet connectivity for residents.

Rural Fiber Expansion in a Rural Area

CHAPTER 5

Common Barriers to Broadband Connectivity

5. COMMON BARRIERS TO BROADBAND CONNECTIVITY

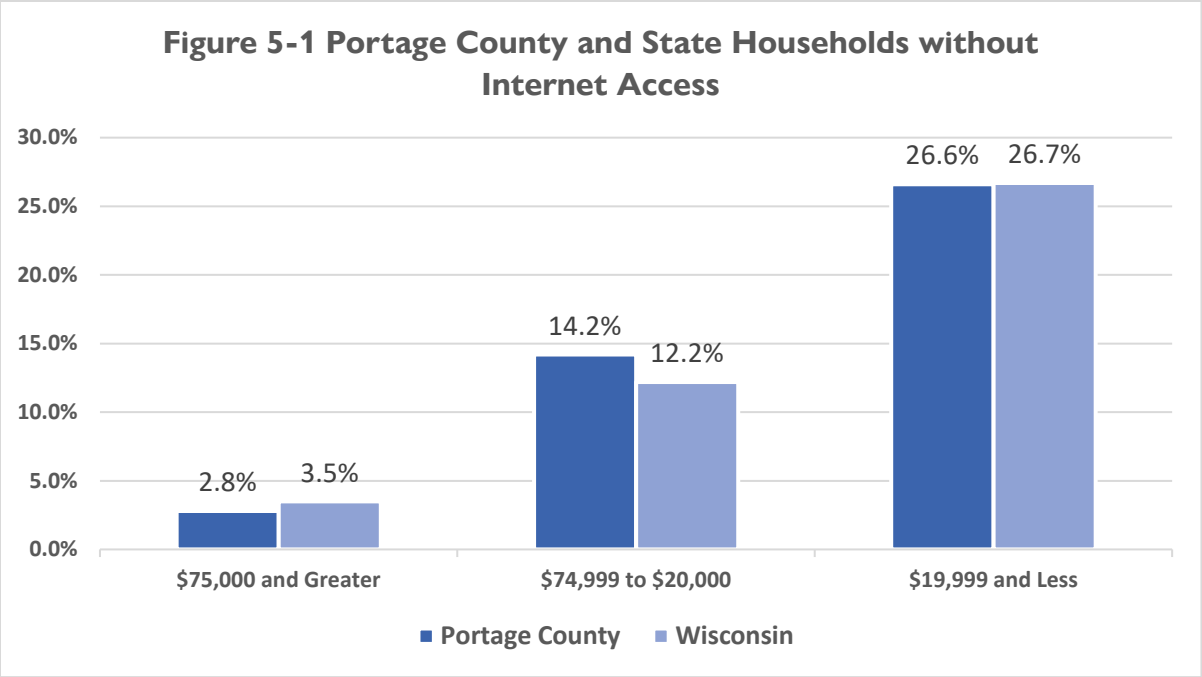
In today's interconnected world, widespread broadband connectivity is essential, yet several barriers hinder its adoption. Common challenges like affordability, a lack of interest in broadband adoption, and connectivity hurdles associated with rural areas continue to persist. These challenges are highlighted in detail below:

AFFORDABILITY BARRIER

The affordability of broadband continues to be a significant challenge for many households. Monthly broadband costs can range from as low as $10 (ex. with a subsidy) to over $100 depending on the speed, the type of internet (ex. fiber, DSL, etc.), and whether the service area is rural. Broadband for commercial use can be up to $1000 per month. In general, American consumers pay higher prices than broadband consumers in other countries, with one study finding that Americans pay two or three times more per month than European consumers.

Research has found that cost is the primary barrier to low-income households having an internet connection at home. According to the Pew Research Center, 45 percent of people mention cost as the reason they do not have broadband at home.

Figure 5-1 shows household incomes and internet subscription rates for Portage County and Wisconsin. Among County households with incomes of $75,000 and above, a substantial 97.2 percent have access to broadband in their homes. Households with incomes of $74,999 to $20,000, 73.4 percent have access to broadband in their homes. For households with incomes below $20,000, 73.4 percent of households have broadband access. Comparing the share of households at the state level with broadband access shows a similar pattern, with the highest earners having the most access to broadband. However, the state has a similar proportion of households with broadband access across each income group to Portage County.



Source: American Community Survey, 2017-2021

Overall, an examination of the Portage County households without an internet subscription shows a correlation between internet access and household income. This is substantiated by the fact that a 2015 U.S. Department of Commerce study revealed that 24 percent of households do not use the internet at home because of cost concerns. Further, 23 percent of all households that did not use the internet at home in 2015 would purchase internet if it was less expensive. In general, broadband affordability is a major barrier to broadband connectivity, and programs and policies to mitigate this should be promoted.

NO INTEREST BARRIER

Lack of interest is another significant barrier to more broadband connectivity in certain places. According to a 2015 study by the U.S. Department of Commerce, 55 percent of households that were not using the internet cited a lack of need or interest as the primary reason for their non-adoption. This trend was consistent regardless of demographics, rural or urban residence, or the presence of school-aged children at home.

There are several factors that might be contributing to this lack of interest. In some regions, people might not be fully aware of the benefits of broadband connectivity or may not understand how to use it to its full potential. Benefits like telehealth, online banking, and online booking/shopping are just a few examples of basic online services that greatly benefit people and have been fully embraced by most people. Along these lines, the lack of digital literacy can also

play a role. If people are not familiar with the internet or lack the skills to use the internet effectively, they may not perceive the need for the Internet. Lastly, cultural and societal factors might also contribute to the level of interest in using the internet.

ACCESSIBILITY BARRIER

Rural broadband faces several challenges that make it a significant barrier to achieving widespread internet connectivity in rural areas. Currently, around 22 percent of Americans in rural areas and 27 percent of Americans in Tribal lands lack coverage from fixed terrestrial 25/3 Mbps broadband, as compared to only 1.5 percent of Americans in urban areas.

Most of the challenges of bringing fast broadband to rural areas are a direct result of the low density of housing in most rural areas. This low density leads to high costs for land-based broadband technology, which results in costs customers will not always pay. The second challenge is that companies that have never sold in a competitive market struggle with marketing and selling broadband. Also, internet service providers might face operational risks associated with failing to execute the business plan as well as increased costs, supply chain issues, etc. Lastly, there are competitive risks to deploying broadband in new markets. Competition can cut costs, try to get customers to sign long-term contracts, or react by upgrading their broadband.

CHAPTER 6

Broadband Strategies and Programs

6. BROADBAND STRATEGIES AND PROGRAMS

ADOPTION STRATEGIES

Increasing broadband adoption is essential for bridging the digital divide. Some of the strategies that public and private entities have done to promote broadband adoption include the following:

1. Digital literacy programs: Increasing people's knowledge about the advantages of broadband and teaching them how to use the internet proficiently can enhance their overall internet experience and encourage broader adoption. For instance, local libraries are ideal places to teach residents how to effectively use and access digital resources.

2. Community Outreach: Engaging the community through outreach programs can raise awareness of the importance of broadband access and the opportunities it brings.

3. Infrastructure development: Investing in building and expanding broadband infrastructure will enable more people to connect to the internet. This includes building more fiber optic networks, fixed wireless, and satellite-based connections. Sometimes, this means providing incentives to service providers to expand their coverage. This includes tax breaks, grants, or streamlined permitting processes.

4. Public Wi-Fi initiatives: Setting up public WI-FI hotspots in areas with limited connectivity can provide access to people without broadband at home.

5. Broadband Affordability: Promote broadband affordability programs such as the Federal Communication Commission's Affordable Connectivity Program or its successor.

GRANTS AND BROADBAND ADOPTION PROGRAMS

There are several programs and initiatives aimed at promoting broadband access and adoption. Both the state of Wisconsin and the federal government have implemented programs that are available to either residents or internet service providers.

At the **state level**, the Public Service Commission (PSC) of Wisconsin's Broadband Office has awarded grants to organizations, (ex. telecommunications utilities, municipalities, or counties) or telecommunications utilities to encourage the deployment of broadband and improve broadband access for Wisconsin residents.

BROADBAND EXPANSION GRANT PROGRAM

Over the past 9 years, the State has run the *Broadband Expansion Grant Program* to encourage the deployment of broadband capability in underserved areas of the state. Since the program's inception, over $200 million in grants have been given to ISPs for broadband expansion.

CAPITAL PROJECTS BROADBAND INFRASTRUCTURE

Under the program name Capital Projects Broadband Infrastructure, the PSC, at the discretion of the Governor, administers limited federal funds to expand broadband access, adoption, and affordability. For-profit internet service providers, telecommunications utilities, co-operatives, local governments, and non-profit organizations are eligible to apply for grants. In fiscal year 2023, the Commission awarded funds from the federal American Rescue Plan Act (ARPA) of 2021 under the Capital Projects Fund (CPF) Broadband Infrastructure Grant Program. CPF Broadband Infrastructure Grants will provide up to $42 million in grant funding during **Fiscal Year 2024** to eligible applicants. As part of the merit criteria, projects that have the highest share and highest index score of vulnerable locations, as defined by the Center for Disease Control's **Social Vulnerability Index (SVI)**, will receive the most points.

ARPA BROADBAND ACCESS

More broadly, the American Rescue Plan Act *(ARPA) Broadband Access Grants* Program administered federal funds for the purpose of expanding broadband, access, adoption, and affordability. ISPs, telecommunications utilities, co-operatives, local governments, and profit and non-profit organizations are eligible to apply for grants. Under the 2020 CARES Act, approximately $5.3 million of total funds were awarded to 12 applicants/projects to expand broadband access. In 2022, using ARPA funds, just under $100 million was allocated for 83 broadband expansion projects.

RURAL DIGITAL OPPORTUNITY FUND (RDOF)

The Rural Digital Opportunity Fund (RDOF) will disburse up to $20.4 billion over 10 years to bring fixed broadband and voice service to millions of unserved homes and small businesses in rural America. Building on the success of the Connect America Fund Phase II Auction (CAF II Auction), RDOF uses a two-phase, competitive reverse auction (Auction 904) that prioritizes higher network speeds and lower latency to ensure the deployment of robust, sustainable high-speed networks that meet the needs of consumers now and in the future.

The RDOF Phase I Auction ended on Nov. 25, 2020, and awarded $9.2 billion in support to 180 winning bidders, including incumbent telephone companies, cable operators, electric cooperatives, satellite operators, and fixed wireless providers. Winning bidders have committed to deploy broadband to more than 5.2 million homes and small businesses in census blocks that previously lacked broadband service with minimum speeds of 25 megabits per second downstream and 3 megabits per second upstream (25/3 Mbps) as determined by FCC Form 477 data. Phase II will cover locations in census blocks that are partially served, as well as locations not funded in Phase I. The Rural Digital Opportunity Fund will ensure that networks stand the test of time by prioritizing higher network speeds and lower latency so that those benefitting from these networks will be able to use tomorrow's Internet applications as well as today's.

ALTERNATIVE CONNECT AMERICA COST MODEL (ACAM)

The **Alternative Connect America Cost Model (ACAM)** provides funding to rate-of-return carriers that voluntarily elected to transition to a new cost model for calculating High-Cost support in exchange for meeting defined broadband build-out obligations. ACAM models the forward-looking economic costs of deploying a high-speed network and delivering broadband service. Carriers that elected this option receive predictable monthly payments to provide voice and broadband service to all funded locations over the program's 10-year support term (2017-2026). Carriers that elected ACAM funding must meet the deployment obligations published in the Public Notice authorizing them to receive A-CAM support. Some of these requirements include maintaining existing voice and broadband service and offering broadband speeds of at least 10 Mbps downstream/1 Mbps upstream (10/1 Mbps) to a number of eligible locations equal to the number of fully funded locations. (locations for which the carrier receives support for the full cost of build-out). Or offer broadband speeds of at least 25/3 Mbps to a number of eligible locations equal to a certain percentage of fully funded locations depending on the population density of the carrier's service area.

ACAM II, established by the 2018 Rate-of-Return Reform Order provides funding to rate-of-return carriers that voluntarily elected to transition to a new cost model for calculating high cost support in exchange for meeting defined broadband build-out obligations. Carriers that elected this option receive predictable monthly payments based on support of up to $200 for each funded location over the program's 10-year support term (2017-2026). (Carriers electing ACAM II support receive transition payments if their ACAM II support is less than their 2018 legacy

support.) Participating carriers must meet annual deployment milestones starting in year four, 2022. Carriers that elected ACAM II funding must meet the deployment obligations such as maintaining existing voice and broadband service as of December 31, 2018 and offering broadband speeds of at least 25 mbps downstream.

The **Enhanced Alternative Connect America Model** (Enhanced A-CAM) is a progressive iteration of its precursor, the A-CAM (Alternative Connect America Model), a funding program designed to address rural connectivity challenges within the broadband telecommunications sector. The new Enhanced A-CAM program sets forth a more ambitious and forward-looking framework for participating carriers to offer broadband and voice service at speeds of 100/20 Mbps (download/upload) or faster to all Enhanced A-CAM required locations within its study area (as determined by the National Broadband Map), compared to the previous A-CAM Program speed requirements of 25/3 Mbps, (FCC Report & Order). The primary purpose of Enhanced A-CAM is to synchronize study areas with the Broadband, Equity, Access, and Deployment (BEAD) program funding initiatives. This alignment is aimed at preventing redundant funding efforts and potential strategic manipulation within the same geographical zones.

BIPARTISAN INFRASTRUCTURE LAW (BEAD & DIGITAL EQUITY ACT)

The recent Bipartisan Infrastructure Bill (BIL) provides $65 billion to connect more Americans to high-speed broadband internet that is affordable and reliable. Within BIL there are several programs that support broadband planning, infrastructure, and adoption. Wisconsin will administer funding under the *Broadband Equity, Access & Deployment Program (BEAD)* program and *Digital Equity Act (DEA)* programs. BIL grant programs are not intended for household or individual applicants. Instead, states will lead planning and grantmaking efforts to provide funding to internet service providers which will build and provide service to households and businesses.

BEAD PROGRAM

Wisconsin's allocation of the BEAD program is approximately $1.06 billion, which was determined through a formula based on the state's proportion of locations lacking access to broadband service. Ultimately, BEAD will support the deployment of primarily fiber internet technology that provides service of 100/20 Mbps to all households and residences in Wisconsin that lack access to 25/3 Mbps service.

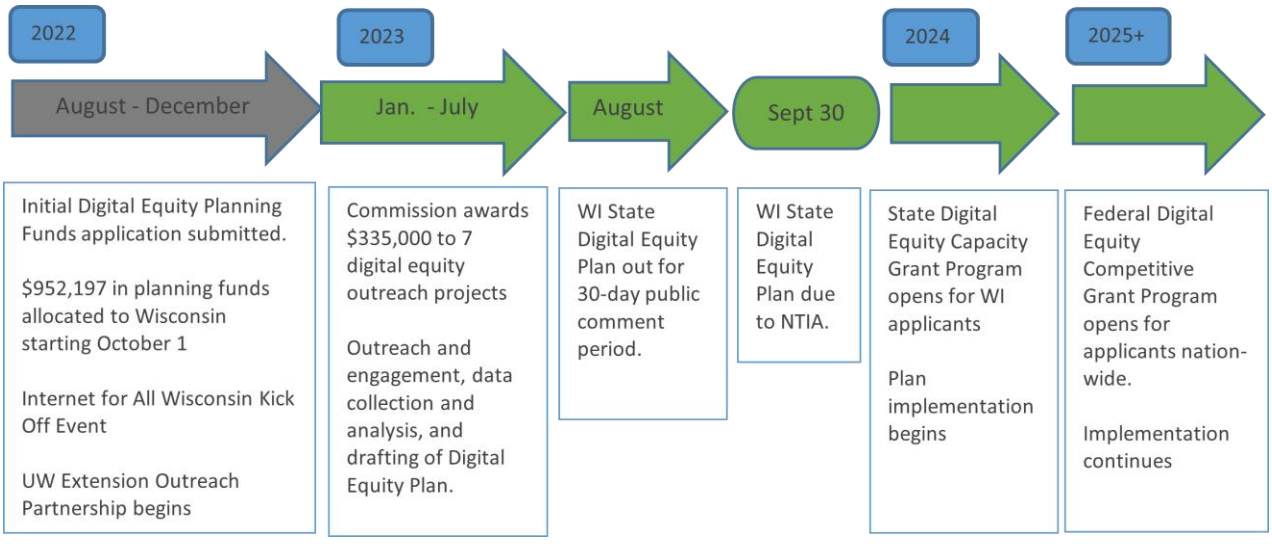
HOUSEHOLD ADOPTION PROGRAMS

Broadband costs continue to be a significant barrier for many low-income households. Local, state, and federal partners have aimed to make broadband affordable by subsidizing the cost of internet for many households.

DIGITAL EQUITY ACT

The Digital Equity Act (DEA) consists of three separate planning and implementation grant programs that promote digital equity. Digital equity is the condition where all citizens have the skills, devices, and broadband service necessary to fully participate in the economy and society of Wisconsin. Specific populations will be targeted with digital equity funding including residents of rural areas, individuals of color, aging individuals, and more. Funding will be distributed through three programs, two of which are administered by the PSC. The first program is the State Planning Program, which provides funding to states based on a formula for the development of a state digital equity plan. Wisconsin's share of planning funds is $952,197. Secondly, the State Capacity Grant Program provides funding to states through a formula to support digital equity projects and implement each state's digital equity plan. Wisconsin's estimated share of capacity grant funding is approximately $24 million to $30 million over five years. The final program is the Competitive Grant Program, administered by NTIA, which will support digital equity projects nationally over a five-year period.

Estimated Digital Equity Act Programs Timeline



AFFORDABLE CONNECTIVITY PROGRAM

The Federal Communications Commission's (FCC) Affordable Connectivity Program (ACP) is a benefit program that helps to ensure households can afford broadband at their home. The ACP provides a discount of up to $30 per month toward internet service for eligible households and up to $75 per month for households on qualifying Tribal lands. Additionally, households can receive one-time discounts of up to $100 to purchase a laptop, desktop computer, or tablet from participating providers if they contribute up to $50 toward the purchase price. One of the guidelines to be eligible for the ACP, is that a household must have an income that is at or below 200 percent of the federal poverty guidelines. Other potential eligibility criteria include participation in certain assistance programs (Ex. SNAP, Medicaid, WIC, etc.), participation in Tribal specific programs (Ex. Bureau of Indian Affairs General Assistance), or approval to receive free and reduced-price school lunch programs.

Participation by internet service providers is voluntary by the company, but most providers in Wisconsin are participating in the ACP program. Several providers offer one or more plans that are covered in full by the ACP discount, resulting in those plans costing nothing for those households.

In the beginning of 2024, the ACP stopped accepting new applications with the program on track to run out of funding by April 2024, unless more funding is allocated by Congress. At the time of the enrollment freeze, approximately 4,623 households, or 15 percent of all households in Portage County had enrolled in the ACP. It is estimated that over 20 percent of households in Portage County qualified for the ACP benefit based on the income requirement.

It is recommended that residents struggling to afford internet utilize the Wisconsin Public Service Commission's Internet Discount Finder to see a list of discounted internet service options available.

LIFELINE

Lifeline is another FCC program that helps make communications services more affordable for low-income consumers. Lifeline provides subscribers with a discount on qualifying monthly telephone service, broadband Internet service, or bundled voice-broadband packages purchased from participating wireline or wireless providers. Lifeline provides up to a $9.25 monthly discount on service for eligible low-income subscribers and up to $34.25 per month for those on Tribal lands. Subscribers may receive a Lifeline discount on either a wireline or a wireless service, but they may not receive a discount on both services at the same time. Lifeline also supports broadband Internet service and broadband-voice bundles. FCC rules prohibit more than one Lifeline service per household.

To participate in the Lifeline program, consumers must either have an income that is at or below 135 percent of the Federal Poverty Guidelines or participate in certain federal assistance programs, such as the Supplemental Nutrition Assistance Program (SNAP), Medicaid, Federal Public Housing Assistance, Supplemental Security Income, the Veterans and Survivors Pension Benefit, or certain Tribal Programs.

FUNDING

Funding and financing broadband projects is essential for expanding access to high-speed internet and bridging the digital divide. Various sources of funding are available, including private sector investments, government programs at federal and state levels, tax incentives and credits to encourage private sector participation, bond financing by local governments, and grants from foundations and nonprofits, particularly for projects emphasizing digital inclusion. Public-private partnerships can also play a crucial role in leveraging resources for broadband expansion. These funding options collectively provide the necessary financial support to develop and deploy broadband infrastructure, ultimately improving internet connectivity and accessibility for underserved and rural communities.

PRIVATE SECTOR INVESTMENTS:

Telecommunications companies and Internet Service Providers (ISPs) frequently allocate resources to expand broadband infrastructure, particularly in areas with a potentially lucrative customer base. Collaboration through public-private partnerships can also incentivize and facilitate such investments.

FEDERAL AND STATE PROGRAMS:

Governments at both the federal and state levels administer programs and initiatives to support broadband expansion. These may include subsidies, grants, and other financial incentives aimed at bolstering infrastructure development.

TAX INCENTIVES AND CREDITS:

In certain scenarios, government authorities may provide tax incentives or credits as a means to stimulate private sector participation in broadband infrastructure investment. These incentives serve to encourage companies to engage in these critical projects.

BOND FINANCING:

Local governments have the option to issue bonds as a financial mechanism to fund broadband projects. The expectation is that the revenue generated from broadband services will eventually cover the debt incurred through bond issuance.

GRANTS AND FOUNDATIONS:

A variety of foundations, nonprofit organizations, and philanthropic entities may extend grants and financial support to broadband initiatives. These sources of funding often prioritize projects focused on digital inclusion and promoting equitable access to broadband services.

COST ESTIMATES

Cost estimation for broadband infrastructure and deployment and programs are important to help seek funding options and partners for each of the proposed broadband expansion projects. See the appendix for cost estimates for each of the proposed project areas based on the OptiDesign Rapid Design Study. Other cost estimates for programs could be developed to help increase the adoption of broadband in Portage County.

CHAPTER 7

Broadband Goals

7. BROADBAND GOALS

The following are goals identified by several entities to bolster broadband access, affordability, and adoption. The State of Wisconsin's Governor's Task Force worked with the Public Service commission of Wisconsin (PSC), Federal Communications Commission (FCC), National Telecommunications and Information Commission (NTIA), and other state and federal agencies, and the public to create a series of goals and initiatives.

STATE OF WISCONSIN GOALS

2023 Governor's Task Force on Broadband Access produced recommendations in five areas for the State of Wisconsin:

PREPARING TO CAPITALIZE ON FEDERAL FUNDS

- Wisconsin needs to plan, coordinate, distribute, and capitalize on the increasing federal funding dollars available, including those through the Bipartisan Infrastructure Law (BIL) such as the Broadband, Equity, Access, and Deployment (BEAD) Program and Digital Equity Programs.
- Support the Wisconsin Broadband Office and Public Service Commission of Wisconsin in their drafting and submission of Wisconsin's 5-Year BEAD Action Plan and Digital Equity Plan.
- Find ways to reduce or combat the impacts of inflation and supply chain pressures to create a more hospitable environment for broadband expansion.
- Continue to find ways to braid BIL funds with other funding sources such as local, state, private, philanthropic, and other federal.
- Recognize and emphasize the importance of other sources of funding beyond the BIL. Advocate for increasing those funding sources to complement the BIL.
- Ensure that all Wisconsinites and broadband stakeholders are aware of federal and state funding opportunities by way of technical support, sharing best practices, webinars, workshops, newsletters, local, regional, and statewide in-person meetings, providing general assistance, and supporting applications.
- Help to secure Wisconsin's future by encouraging the use of federal dollars on forward thinking and future proof solutions.
- Support, engage with, and consider the needs of Internet Service Providers and Telecommunications Associations in their preparations for the BEAD program.
- Explore and promote available low-interest loan programs that help to support internet service providers in their pursuit of broadband infrastructure expansion.
- The Wisconsin State Legislature should consider flexibilities and/or waivers to existing State statutes that may be burdensome to federal funding investment.

- Fiber technology should be prioritized, but not exclusively required in publicly funded broadband deployment. Terrestrial fixed wireless solutions are viable in particularly hard-to-reach areas and/or as a short-term solution.

SUPPORTING LOCAL COMMUNITIES

- Support organizations such as the Public Service Commission of Wisconsin, University of Wisconsin – Madison, Division of Extension, and Wisconsin Economic Development Corporation in their technical assistance efforts.
- Maintain a continued focus on how best to assist local communities in broadband planning to ensure their involvement and participation in the rollout of federal funds.
- Support local broadband champions, including digital navigators embedded within the community.
- Help these champions and navigators carry out and see through their community connectivity vision.
- Continue to improve and promote broadband planning playbooks and toolkits available to local communities.
- Find more ways for the public to better understand and utilize broadband maps and data.
- Encourage public participation and input in the planning process where appropriate.
- Engage local communities through statewide listening sessions and take information and stories to the Task Force for continued advancement and strengthening of the Task Force annual report.

WORKFORCE DEVELOPMENT

- Support and include organizations such as workforce development boards, economic development, labor groups and unions, contractors, high schools, higher education and technical colleges, and State agencies (DPI, DWD, PSC). Ensure that these organizations are connected with internet service providers and telecommunications associations to increase awareness and create a sustainable and viable pipeline of talent.
- Ensure a sufficient and trained telecom workforce for internet service providers, contractors, and subcontractors to construct, operate and maintain current and new broadband infrastructure.
- Where practicable and with input from higher education and employers, Wisconsin should encourage hiring from within local communities to help retain local talent and grow good jobs within Wisconsin.

MAPPING AND DATA

- Promote the Federal Communications Commission's (FCC) National Broadband Map and the opportunities for the public and stakeholders to challenge availability and location data within the map.

- Continue to support statewide speed testing and surveying such as funding and promotion of the OptiMap (formerly known as Geo Partners) software and the Wisconsin Internet Self-Report (WISER) survey.
- Support local communities in their efforts to pursue, intake, and make meaning of local data.
- Align state mapping efforts and products with the federal government.
- Find ways to quantify and capture the quality of broadband service beyond basic metrics like download and upload speed.

AFFORDABILITY AND ADOPTION

- Continue outreach and promotion of the Affordable Connectivity Program (ACP) to reach the highest possible levels of participation in Wisconsin.
- Maintain federal funding for the ACP program to ensure access to this vital program for eligible households in Wisconsin. Consider establishing a state internet assistance affordability program.
- Increase outreach and engagement with underserved populations such as aging individuals, incarcerated individuals, veterans, individuals with disabilities, individuals with a language barrier, individuals who are members of racial or ethnic minority groups, and individuals who primarily reside in rural areas to ensure all Wisconsin residents can make full use of the internet.
- Wisconsin should develop and define standard metrics for affordability of broadband services for all Wisconsinites.

NORTH CENTRAL WISCONSIN REGIONAL RECOVERY PLAN BROADBAND GOALS

The following goals were identified in the North Central Wisconsin Regional Recovery Plan. The Advisory Committee, who were represented by economic development professionals from throughout the region, identified these goals as the most important to the vision of the future of broadband in the region.

- Create universal broadband infrastructure throughout the region.
- Bring high-performance broadband service throughout the region.
- Make broadband affordable and competitive.
- Advance digital literacy and inclusion.

CENTERGY-CENTRAL WI ALLIANCE FOR ECONOMIC DEVELOPMENT, BROADBAND GOALS

The following goals were identified in the Centergy Region to assist with planning at a regional level.

- Inventory existing efforts across region, such as past Broadband Expansion Grant recipients, past broadband plans and studies, past surveys, existing maps, etc. Outcomes: This inventory and research will allow staff to create a baseline of existing and current efforts which will help inform us of the next steps in our planning process.
- Form a regional broadband committee with appointments from each of the counties and tribes. Outcomes: This committee will be the working group for the duration of the project. They will assist staff in outreach and communication to their respective counties/tribe and communities.
- Coordinate and implement sub-regional meetings for communities (these may be in-person or virtual depending on the input received from the regional broadband groups. Outcomes: These meetings/sessions will help inform the regional broadband vision and goals by providing stakeholders with an opportunity to be engaged.

PORTAGE COUNTY GOALS

- Internet speeds of 100 Mbps download and 100 Mbps upload are available county-wide.
- Affordable plans are available county-wide.
- Promote low-cost or free access at community anchor points.

CHAPTER 8

Recommendations and Conclusion

8. RECOMMENDATIONS AND CONCLUSIONS

BREAKING POINT SOLUTIONS, LLC ANALYSIS

A broadband gap analysis assessment of the potential expansion of broadband internet access within Lincoln County was performed by the consulting firm Breaking Point Solutions LLC. This analysis included several broadband implementation strategies including both design and financial analysis in order to explore a wide range of broadband expansion possibilities. Each expansion scenario included a cost model that considered several elements including anticipated grant funding.

Key Factors:

Since the initial announcement of BEAD allocations for the state, subsequent updates to the FCC fabric have significantly reduced the county's pro-rata allocation by nearly half. With a 25% match, the current FCC fabric suggests that the county would receive approximately $3 million under the BEAD program. Despite the relatively low funding level, there are factors that could mitigate this. The presence of three significant ISPs in the county, namely Charter, Solarus, and Union Telephone, could support broadband expansion. These ISPs have made strides in serving both urban and underserved areas, presenting an opportunity for collaboration to enhance community connectivity.

The county should consider exploring partnerships with these existing providers to address gaps in coverage and improve overall connectivity. Additionally, the absence of poverty, socially vulnerable communities, and NTIA high-cost areas in the county may contribute to the projected allocation being lower. A wireless solution, covering approximately 96% of the underserved Broadband Service Locations (BSLs) in the county, could be a cost-effective option. However, discussions with regional ISPs like Bug Tussel and Country Wireless may be necessary, considering their current technology limitations and potential challenges in obtaining licensed spectrum.

Subsidized Construction:

In the subsidized construction approach, where the total project cost is estimated at $5 million, collaboration with an independent ISP becomes crucial. Even if the community considers becoming the ISP itself, a negative Internal Rate of Return (IRR) may pose challenges. To address this, negotiations with the ISP to determine a profitable construction cost could be explored. If a shortfall exists, the community could secure additional funds through public sources or grants to bridge the gap. Ownership of relevant infrastructure leased to the ISP could be a strategy to ensure a return on the community's investment. Some hybrid fiber and wireless models with positive IRR may be attractive to ISPs capable of working with both technologies.

Phased Construction:

In the phased construction model, completed phases generate cash for subsequent deployments. Whether the ISP reinvests, or the community becomes the ISP, key infrastructure needs to be addressed. These include field service and customer service response, access and billing systems, and network management response. Community ownership of the infrastructure allows access to municipal financing, network revenues to manage ongoing expenses, and potential profits for expansion and community projects. The phased construction strategy suggests starting with a fixed wireless network for rapid, cost-effective deployment, later transitioning to fiber, or continuing with both technologies based on community needs and demand.

Ultimately, the choice between fixed wireless and fiber projects will depend on factors such as budget constraints, demand, and construction costs. Leveraging community enthusiasm and potentially financing through assessment districts could provide additional avenues for network expansion. The goal of achieving 100% fiber could be realized by repurposing fixed wireless hardware as each fiber construction phase is completed, maximizing the revenue stream for network expansion.

The recommended alternative, known as “C3”, seeks to expand broadband in Portage County through the deployment of a blend of fiber and fixed wireless solutions. This alternative seeks to strike a balance between the goal of extending broadband access to as many underserved households as feasible and acknowledging the financial constraints associated with expanding broadband. Table 8-1 highlights the key details of this alternative. Full details are located in the appendix.

Table 8-1 Mixed Fiber and Fixed Wireless Recommended Option (C3)	
# of Fiber Households	215
# of Wireless Households	472
Uncovered Households	35
Fiber Coverage Rate	31.3%
Fixed Wireless Rate	63.6%
Combined Coverage Rate	94.9%
Total System Cost	$2,891,125

ADDITIONAL RECOMMENDATIONS

Comprehensive strategies are needed to address broadband gaps. Here are recommendations for bridging these gaps:

INFRASTRUCTURE INVESTMENT:

Investing in infrastructure is crucial for improving broadband access and connectivity. Broadband funding, including BEAD and other available sources, presents significant opportunities for the expansion of high-speed internet access in Portage County. Here are recommendations for governments and organizations looking to invest in broadband infrastructure:

1. Assessment and Planning:
    - Utilize current assessment of broadband infrastructure and coverage to fully understand broadband gaps.
    - Collaborate with Internet Service Providers (ISPs) to expand broadband services to high priority areas, residents, and businesses within Portage County. Consider submitting a "Request for Information (RFI)" to learn more about ISPs services and their plans.
    - Understand the physical broadband technologies that can best meet the needs of the community (Ex. Fiber, DSL, Fixed Wireless, etc.). Each solution will be influenced by factors such as: available infrastructure and broadband providers, capital costs, topography, potential sources of interference, current community adoption, and existing and future broadband needs. For example, DSL may be effective up to 2-3 miles maximum, while fixed wireless towers may be effective up to 5-10 miles if there is good line of sight.
    - Consider the allocation of funding for broadband infrastructure development in areas that first prioritize "unserved" areas and then "underserved" rural areas.

- Utilize relevant data and maps to position the community for potential grant projects.
- Keep informed about current funding opportunities, including the Bead program, along with details and deadlines for applying for grants.

2. Public Awareness and Engagement
    - Continue to engage the Portage Broadband Committee and ensure that they are actively involved in decision making.
    - Involve the community in the decision-making process by conducting public forums and awareness campaigns. Engaged citizens are more likely to support and participate in broadband infrastructure development.
3. Remove Barriers
    - Adopt dig-once and joint trench-use policies and ordinances. Require that conduit or fiber installation will be allowed in R-O-W and require related notification.
    - Adopt public rights-of-way policies that waive fees or expedite use for broadband installation.
    - Adopt tower ordinances that allow agreements for the installation/cp-locating of antennae and equipment.
    - Amend zoning, subdivision, and design review ordinances to consider, encourage, or require the installation of broadband. Potentially include design plates or cross-sections with standards.
4. Regular Assessment and Adjustment
    - Once broadband infrastructure is deployed, periodically review the effectiveness of infrastructure investments, and adjust as needed. Encourage residents to continue taking speed tests.

PROMOTE AFFORDABLE BROADBAND

1. Public Awareness and Engagement
    - Promote the PSC's Internet Discount Finder which provides resources that support affordable access to broadband.
    - Utilize the (ACP) government outreach toolkit.
    - Raise awareness about these programs through advertising, both online and offline. Use social media, local newspapers, radio, and TV to reach a wide audience.
    - Partner with community centers, schools, libraries, and local nonprofits to spread the word. They can assist in reaching specific demographics.
    - Engage local government officials to endorse and support these programs. They can help with funding, resources, and promotion.
2. Tracking and Reporting
    - Monitor the impact of your promotion efforts through analytics and data collection, adjusting strategies as needed.

BROADBAND EDUCATION

1. Increase Digital Literacy
    - Provide digital literacy training to help individuals and families navigate the internet safely and effectively.
    - Organize workshops and classes at local schools, libraries, and community centers.
    - Partner with local organizations to deliver training programs.
2. Raise Awareness
    - Create public awareness campaigns about the advantages of broadband access, such as education, job opportunities, healthcare, and entertainment.
    - Highlight success stories of individuals and communities that have benefited from broadband.

IMPLEMENTATION

1. Designate a point of contact who can help facilitate the next steps and communicate directly with ISPs.
2. Work with and support ISP efforts to expand broadband infrastructure.
3. Pursue additional broadband funding opportunities and watch for updates to the Affordable Connectivity Program.
4. Utilize this report to inform future broadband efforts.

CONCLUSION

This broadband plan outlines a strategy for the deployment and expansion of high-speed internet access within a specific region or community. Typically, such a plan includes key components like an assessment of current broadband infrastructure and demand, identification of funding sources and financial strategies, mapping of coverage gaps, and goals for improving connectivity. It often involves collaboration between public and private sectors, aiming to enhance digital inclusion and equitable access to the Internet. Broadband plans play a crucial role in addressing the digital divide and promoting economic growth and innovation by ensuring that robust internet connectivity reaches all residents and businesses within the target area.

The digital age has ushered in a world of opportunities, but millions are still left on the wrong side of the digital divide, unable to access the benefits of high-speed internet. Now, it's time to act and change that. The information in this plan is intended to help the county engage internet service providers and leverage BEAD funding to help make good decisions to benefit the citizens of Portage County with expanded high-speed broadband expansion.

APPENDIX

A. OptiDesign and Recommendations

B. Broadband Maps

C. PSC County Summary

D. Internet Service Providers

E. Additional Resources

F. Glossary

A. OPTIDESIGN AND RECOMMENDATIONS

Portage County OptiDesign

The next pages are intended to be a general summary of the OptiDesign study completed by Breaking Point Solutions for Portage County. More details can be found by going online at:

https://expressoptimizer.net/projects/WI%20Portage/index.php

Access Code: WI Portage Access

OptiDesign™

Project Overview

Contents

Version April 12, 2023

Objective

According to our agreement, we are to provide:

1. Design materials
    a. Full fiber-to-the home
        i. Including backbone fiber recommendation & cost
        ii. City & Census block detail
        iii. Projected fiber cost & CPE (Customer Premise Equipment) cost
    b. Full fixed wireless
        i. Including backbone fiber recommendation & cost
        ii. City & Census block detail
        iii. Projected fixed wireless cost & CPE cost
    c. Full hybrid
        i. Including backbone fiber recommendation & cost
        ii. City & Census block detail
        iii. Projected fiber cost & CPE cost
        iv. Projected fixed wireless cost & CPE cost

2. List of assumptions

3. Explanation of recommended technologies

4. Explanation of the methodology used to arrive at projected deployment costs and reasonable project markups in actual deployments

5. Discussion of budgeting, financing & grant options

6. An online interactive system that can be used to review each design element and can be shared with members of the community

Our Approach

Breaking Point Solutions, LLC owns, licenses, and supports OptiExpress™ Software which is a cloud-based platform designed to provide communities, designers, and implementers with tools to optimize their ability to cost, design, and deploy cost effective broadband networks.

The software embodies the capabilities of a GIS (Geographic Information System), a data warehouse, and utilizes both conventional and proprietary mathematics derived from operations research to truly optimize designs based on the unique constraints of each design problem.

The financial analysis components allow us to look at multiple "what if" scenarios to help the community explore a wide range of possible broadband implementation strategies.

The Study

The OptiExpress™ Software, previously known as GEO™ Software, contains an extensive database of many factors which go into a network design. Much of the data is based on U.S. Census blocks. Census blocks are statistical divisions of census tracts, generally defined to contain between 600 and 3,000 people. Most were delineated by local participants in the Census Bureau's Participant Statistical Areas Program. In rural areas, where the population density is lower smaller numbers of people may be in a census block. In this study, household data was extracted from the 2020 U.S. Census.

For wireless signal propagation the data base is derived from the National Elevation Dataset which is the primary elevation data product of the U.S. Geological Survey. The clutter database is derived from the U.S. Geological Survey's Land Cover Institute family of products.

Other public and private data products are used to support the studies.

Partial Database Content

Block Groups Ready:	9,891,813
Block Groups Available:	7,541,824
Block Groups In Cities:	4,395,350
Elevation Measurements:	21,773,070,000
Clutter Measurements:	15,733,828,800
Shape Polygons:	9,926,713
Cities:	29,767
Townships:	35,611
Canadian Block Groups:	489,595
FCC Block Records:	323,971,433
Public KML Records:	233,936
Your KML Records:	41,484
Geocoded Street Addresses:	365,461
Tower Records:	489,532
Non U.S. Elevation Measurements:	3,836,160,000
USDA records:	812,657
Road Segments:	31,643,487
MLAB speed tests:	204,733,415
OOKLA speed test cells:	1,936,290
GEO speed tests:	481,176 / 0
Structures:	128,512,613

Key metrics were produced from the study:

1. Percent of households covered. This metric identifies the potential household coverage given specific cost constraints.

2. Project cost per household. This metric identifies the cost per household for a specific cost constraint.

3. 5 year Internal Rate of Return for ISPs. This metric, given subscription rate assumptions and subscription fee assumptions, provides an investment finance perspective on the feasibility of a design, from an investment point of view. As a general rule, if the Internal Rate of Return is greater than 80%, this is a project that could be considered by a Coop. As a general rule, if the Internal Rate of Return is greater than 100%, this is a project that could be considered by a for profit ISP. If the Internal Rate of Return less, this is a project that would require a subsidy such as a grant as an offset. In the Spreadsheet provided, you can use the Excel **What-If Analysis** to target a specific IRR by varying either the subscription rate or subscription fee This data is provided in spreadsheet format which may contain between 2 and 9 studies, depending upon the area complexity.

Cost Models

There are four cost elements that go into a network design cost analysis:

1. The cost of connecting a household.

2. The cost of providing a backbone or backhaul data pipe servicing a large number of households.

3. If a hybrid design, the costs of the fiber to the home plus the cost of the fixed wireless data pipe.

4. For designs which include fixed wireless, we provide information showing a wireless backhaul design. Fiber backhauls are incorporated into the fiber designs such that they are either contiguous or if not, easily connected to existing backbones.

Our specific assumptions are shown in the Technical Materials section in the Methodology Notes document.

All costing presented is "estimated actual cost." This is the estimated cash outlay required to implement a design and includes estimated finance charges, project management and other anticipated finance and project fees.

Raw Data

We have provided raw data for the census blocks in each study area. This will permit you to review the study results for each census block in the study. This is a spreadsheet with the following content:

lat	Latitude of census block centroid
lon	Longitude of census block centroid
pop	Population in census block
households	Households in census block
squaremile	Square miles of census block
radius	Mean radius of census block
housingdensity	Households per square mile of census block
state	State
xmin	Bounding Box of Census block
ymin	Bounding Box of Census block
xmax	Bounding Box of Census block
ymax	Bounding Box of Census block
nfcc	Number of FCC providers
Blockid	Census Block number
type	Type of connection 1=fiber, 2=wireless
totalfeet	Estimated total feet of fiber required to connect all households if used
towerid	Tower ID if -1, no tower is connected to this census block, if type is also 2, there is no connection derived in the study other than existing services
Connection mode	0= none, 1 = fiber, 2 = either, 3 = fixed wireless

Supporting Documentation

We have provided a permanent link web URL that contains the results of this study.

All documents and the key study documents that were created during this study can be found at that link.

The link can be made available to the general public and shared as needed by the community.

The link is password protected and the password will be provided to the project sponsors for release at their discretion.

There are two possible actions when you click on a link on the above:

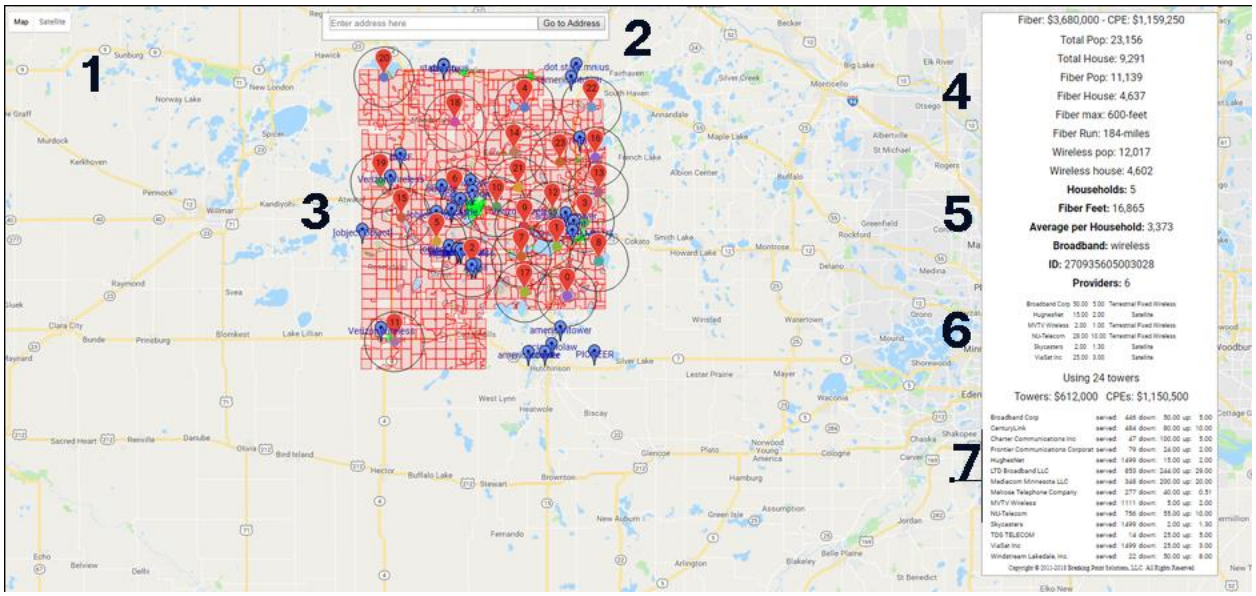
1. A supporting document will be downloaded to your device
2. A new window will open showing either options or the study content for that link

System Requirements for Supporting Documentation

1. Any modern browser such as Internet Explorer, Chrome, Safari.
2. Javascript must be enabled in your browser.
3. Pop Up blockers may need to permit access to the Study Page site.
4. A connection to the internet. Some of provided content is over 10 megabytes and may take some time to download on slower connections.
5. The content is not phone friendly. It will load, but it will be difficult to see everything. An ideal screen resolution would be 1920 X 1080 or higher
6. The content does not use cookies or any tracking mechanism
7. The content was released virus free and will be periodically scanned to ensure secure and safe operations

Using The Maps

Some of the maps have interactive content. A typical display is divided into several areas where information is shown, or changes can be made.



You can zoom to an area of interest using the mouse wheel or by using the pinch-zoom on your touchpad or using the icons in the lower right corner. 

There are a number of features found in this display which can be utilized to support your review and evaluation process. The numbers on the display above correspond to the Area discussion below:

Area 1

These are your map controls. They allow you to change the background appearance of the map

1. Map 

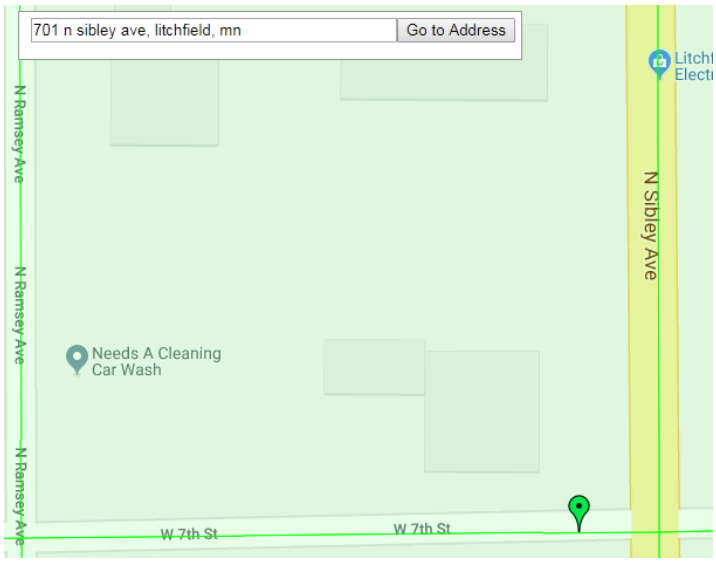
: Map selects a roadmap view. It has an option to add terrain view to the roadmap.

2. Satellite 

: Satellite selects a satellite view. It has an option to add labels to the map.

Area 2

This is your address search. If you enter an address into the box and then click the **Go to Address** button, you will be zoomed into the specific address which will be shown by a green dot. If you move the mouse over the green dot you will see census block information update in Area 5 (below). If you type in an incorrect or unknown address, the system will take you to the best available location which literally, can be anywhere in the world.



The Toggle Button 

Permits you to view various overlays on the map. By pressing it repeatedly, you will see different overlays appear and disappear. For RF studies, the best way to see coverage is to find the location of interest with no overlays, then toggle the RF overlay. In RF overlay mode, the colors are interpreted as follows:

Green – probable signal at ground level

Yellow – probable signal at 12 foot elevation

Orange – probably signal at 24 foot elevation

Red – probable signal at 32 foot elevation.

No color – Requires antenna elevation above 32 feet

Area 3

This is the study area of the design. It displays every census block in the design. If the area is a light green, then that is a proposed fiber to the home area. If the area is a light red, then that is a proposed wireless area. If the area is lavender then that area can be served by either fiber or fixed wireless. If the area is yellow, the design study could not find a reasonable connection to that census block.

Area 4

This is an overall summary of the current design. It shows the demographics and basic assumptions of the overall design

Area 5

These are the specific details for the census block under your mouse pointer. It identifies the households, the estimated fiber run required and the type of internet access proposed for this census block.

Area 6

This shows the availability of internet service providers for the census block under your mouse pointer, as reported to the FCC. It shows the reported maximum download speed, upload speed, and technology. It is not uncommon for this data to have errors. Be sure to check with the listed provider(s) for actual capabilities.

Area 7

This shows the best services available for all the internet providers in the study area as reported to the FCC. If you move your mouse pointer over their names, the map display will update showing their reported coverage areas.

On lower resolution displays, some information groups may overlap. You can drag them to different areas of the display or resize them.

For RF maps, the RF overlay can be toggled on or off by repeated clicking the Toggle button at the top of the screen.

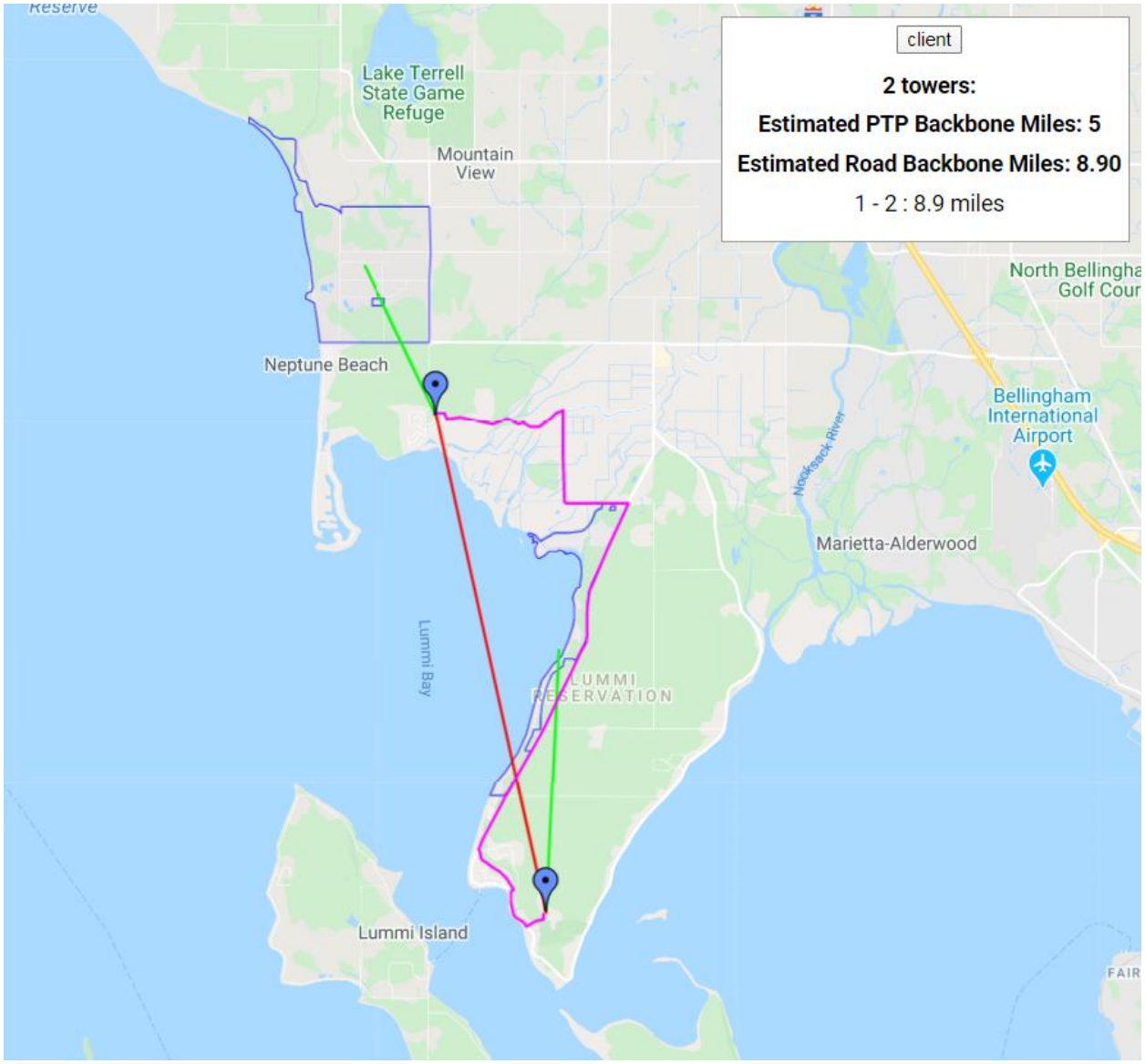
USDA Grant Analysis

Using the Multiple program grant criteria, we are able to provide preliminary information regarding the area's acceptability to the generic grant applications as a grant candidate. We are able to determine the following grant related attributes.

1. Estimated farms per the USDA formula
2. The housing density to be qualified for rurality. (two measurements)
3. The # of census blocks, households and population residing in opportunity zones.
4. The underserved ratio according to FCC fabric data
5. Points available for critical community facilities.
6. Points available for educational facilities
7. Points available for health care centers
8. Potential census blocks that overlap or have overlapping borders with protected areas defined by the USDA
9. Economic opportunity zone percentages
10. SAIPE percentages – Economic need of the community
11. SVC percentages - Socially Vulnerable Communities
12. % of households in tribal areas
13. RDOF coverage by census blocks and household counts
14. BEAD % compliance with 25/3 by FCC data
15. BEAD % compliance with 100/20 by FCC data
16. Speed test compliance with BPS speed test data
17. Previously funded potential coverage conflicts by census block with maps

Tower Fiber Routes

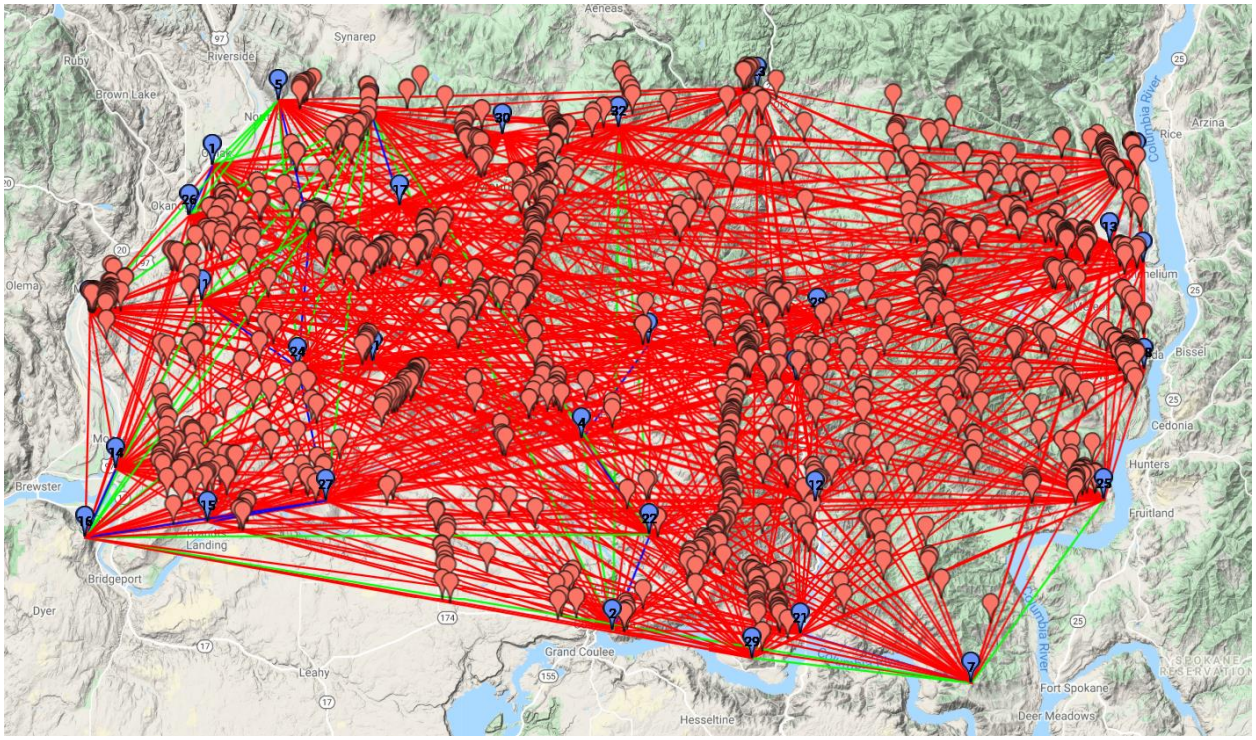
This map will display the minimum spanning tree distance connect all towers to a common network. The line is shown in purple and a corresponding KML file is provided. Green lines indicate possible fiber availability within 3 miles and shows the census block outline where that was reported to the FCC on fabric data submissions. When you place your mouse over a tower which has a green line, it will indicate the company that reported fiber and their reported speed.



Tower Line of Site Analysis

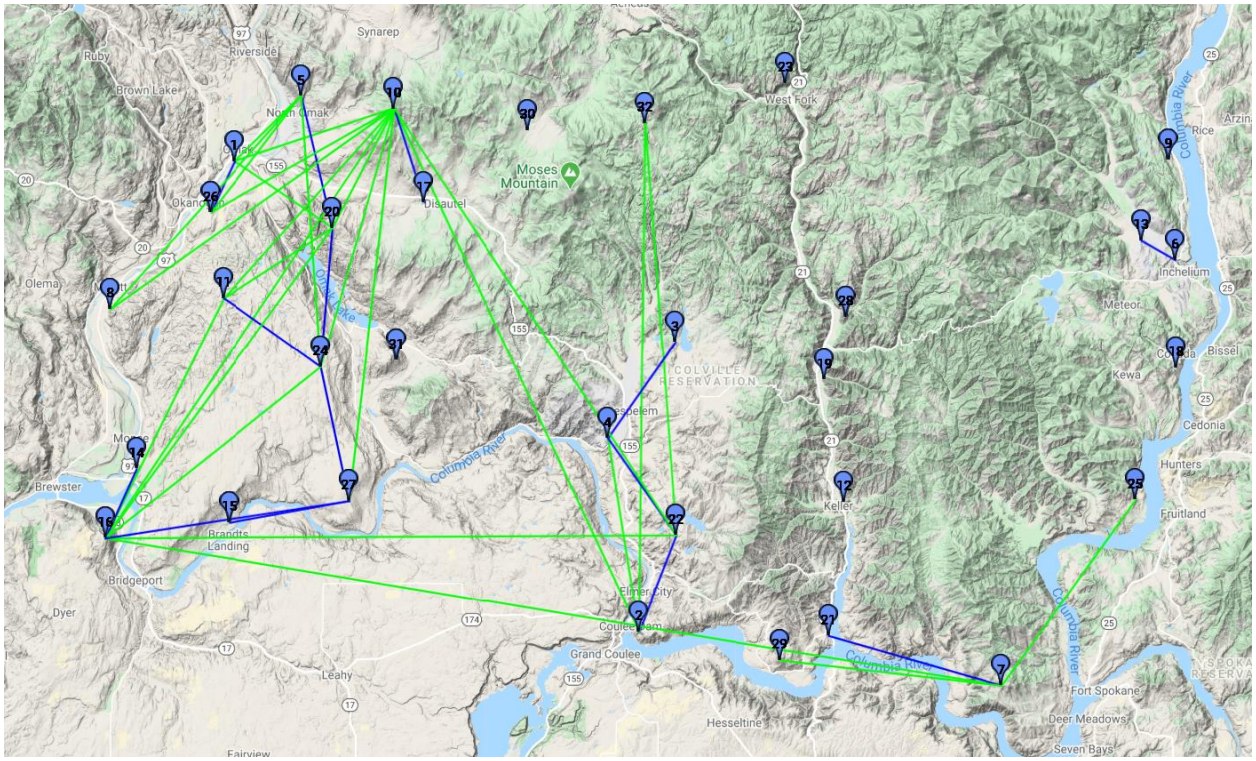
This will show every possible tower to tower link for line of site backhaul. If a link can be found, fiber routing may be avoided.

In large tower count cases, this map can initially appear confusing.



Every tower that must be connected is shown with a blue pin. Every tower required to complete a link is shown as an orange pin. Recommended routes are shown with blue lines. Alternative routes are shown with green lines, and routes which require a link tower are shown with red lines.

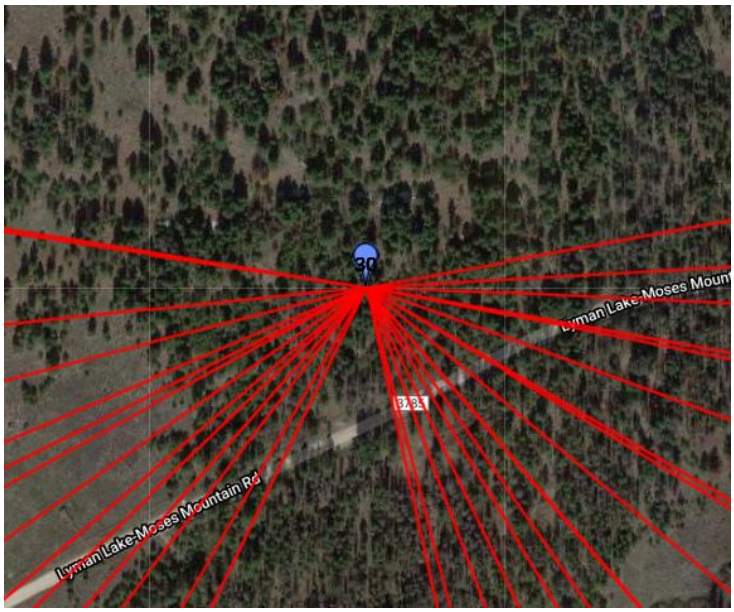
If you click on the map anywhere, you will only see good links which require no intervening tower.



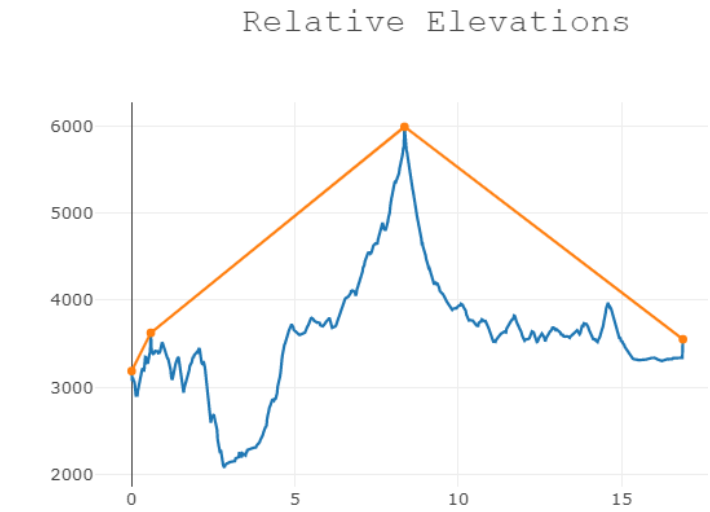
If there is a blue line, the system determined that route as the best path for connecting those two towers. If there is no blue line, but there are green lines then the system was unable to recommend one link over another. If the tower stands in isolation, then either a fiber run must be made to the tower or an intermediary link tower must be built.

To examine the options zoom in to the tower to study.

Then click on the map again. You will see every possible connection path for that tower.



As you move your mouse over each line, you will see a display showing the terrain elements. Each orange dot indicates a recommended placement for an intervening link tower. Ideally you are looking for only one intervening tower.



Once you've identified a route of interest, scroll the map along that path until you locate the tower (orange pin) that would be required to complete the link.

You can now examine this location to see if it is a feasible link opportunity.

Web Site Organization

Your website has a relatively standard layout as shown below. Some variations may be expected depending upon the complexity and focus of the study.

The website is divided into two columns of links. Each link will either open a new tab for a display, or it will download a document.

Typical content will look like this:

Your Community- Rapid Design Study

Contents

Project Overview	What were our objectives in doing this study?	**Technical Detail**	Additional technical materials
Public Domain Known Fiber	Publicly known fiber that could support a deployment		
Providers Known to the FCC	Reported services currently in the area from FCC fabric data with MLAB speed test overlay	**Recommendations**	
Middle Mile Routes	Optimum Population Density Drive Middle Mile Routes		
Pure Fixed Wireless Design	Design content for a fixed wireless deployment.		
Tower Fiber Routes - MAP	Optimal fiber route to interconnect towers - Fixed wireless design		
Tower Fiber Routes KML	Optimal fiber route to interconnect towers - Hybrid Design		

Recommended Hybrid Design	Design content for a mixture of FTTH and fixed wireless unlicensed spectrum
Hybrid Tower Fiber Routes - Map	Optimal fiber route to interconnect towers - Hybrid Design
Hybrid Tower Route KML	Waypoints of fiber route in KML format
USDA Grant Analysis	Detailed summary of all known USDA Reconnect points and potential application issues
USDA Grant Analysis Detail	Block group detail from the grant analysis
Methodology Notes	How we do these studies
Technology Overview	Detailed information about various technical details
Raw Data	Details of key inputs for every block group in the study
Municipal Bond Analysis Sheet	Cash Flows and Sensitivity Analysis. This is a security managed spreadsheet. You must have a connection to the internet and enable Macros to use this
Community Education Materials	Some materials which help members of your community understand broadband
About Us	

Portage

Recommendations

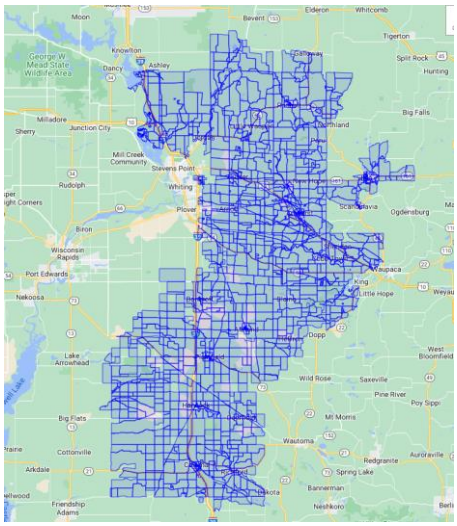
Contents

Key Factors

Since the initial BEAD allocations were announced for the state, the subsequent updates of the FCC fabric have dramatically reduced the county's pro-rata allocation by almost half. As a result, with a 25% match, the current FCC fabric indicates that the county would receive approximately $3 million under the BEAD program.

There are, however, several factors that could mitigate the relatively low funding level. The first is that there are three significant ISPs in the county today that could support broadband expansion, irrespective of the total BEAD funding availability. Charter has a significant presence around Stevens Point and has started some degree of penetration into the surrounding un/underserved areas. Solarus has similarly gnawed away at some of the remote rural areas around Stevens Point and has optical fiber capabilities that could be expanded inward covering much of the un/underserved areas. Finally, towards the south eastern portion of the county, Union Telephone company has made some inroads into this region with fiber as well. There current overall service territory is adjacent to, if not already in the southern areas of most need.

Union Telephone Service Territory



The county would be well served to explore completing deployments among these three providers to fill the gaps in what is an otherwise relatively well served community.

In terms of other potential factors, the county lacks, poverty, socially vulnerable communities, and NTIA high cost areas that might otherwise increase the projected allocation.

If the community chose too, a wireless solution would cover about 96% of the un/underserved BSLs in the county and relatively low cost overall. Of the regional ISPs, Bug Tussel and Country Wireless would be reasonable discussion targets, however, their current technology choices are inadequate to meet the BEAD requirements of at least 100/20 and licensed spectrum may be difficult for them to obtain.

Subsidized construction

In this approach, the total project has a probable cost of, for example, $5 million. Unless the community would consider building and operating the network, it will likely be trying to work with an independent ISP. But even if This area is considering being the ISP itself, the business case analysis is similar.

An ISP may look at the total market value of the project and conclude that if it spends $5 million, it will have a negative Internal Rate of Return (IRR). It would lose money during a time frame of a few years, and will therefore look elsewhere to projects where it will create a better return. One possible approach here is to work with the ISP and discover how much the project needs to cost for it to find construction profitable. If for example, the ISP believes it could be sufficiently profitable at an investment of $4.5 million, then the community could identify a source for the additional $500,000 estimated cost of the network. This could be via public money (whether bond or other source) or securing a grant from another party. Once the community is committed to partner with the ISP, it could request to own some of the relevant infrastructure and lease it to the ISP in order to ensure the community has a return on its investment.

Some of the hybrid fiber and wireless models show a positive IRR, so they can be considered attractive to an ISP that is capable of working with both fiber and fixed wireless. A growing number of ISPs have this capability.

Phased Construction

In a phased construction approach, each completed phase generates cash for the next phase of deployment. In this model, either the ISP agrees to reinvest at a certain rate, or the community becomes the ISP. If the community becomes the ISP it almost certainly lacks key infrastructure that must be created or subcontracted out. Key among these are:

1. Field Service response. When things break, and they will, someone must go fix what is broken. The community could either train existing utility workers, or subcontract these services to a regional provider.

2. Customer Service response. Essentially, this is a call center function, the first line of problem reporting by the retail customer. The community must have the means of taking inbound calls, and either fixing problems over the phone or dispatching field service response. This can be developed in house if there is an existing call center capability, or subcontracted if there is not. Some have chosen to subcontract this in early years and then internalize it later.

3. Access and billing: Each authorized user on the network must be authenticated and enabled or not in order to access the services. This requires an access control server(s) in a data center which is centrally located internal to the ultimate network design. Further, authenticated users need to be billed for access. Again, the community could either purchase and manage this server and software, or subcontract this to a regional provider.

4. Network management response. Adverse weather, accidents, and core equipment failures will from time to time take down large portions of the

network. Where hundreds or thousands of users are affected, this requires a 24/7 response team of network engineers who can be dispatched and repair network problems. Again, existing utility workers could be trained to provide this response, or this could be subcontracted out.

The phased construction model works best if the community itself owns the infrastructure that is built. Owning the network does not necessarily require the community to operate it – much of it can be contracted out or provided via a partnership. This provides:

1. Access to municipal financing where the network itself becomes the collateral for the loan.
2. Access to the network revenues to manage the network ongoing expenses.
3. Access to "profits" to pay for network expansion. Over time the "profits" will increase which will accelerate deployments to other areas, in phases, which will in turn increase revenues. Once the network is complete, these "profits" can be used to pay off any outstanding debt, and subsidize other community projects.
4. Potentially otherwise uninterested municipal financing organizations can be "enticed" to participate if the community offers to share a portion of the "profits" to the financing organization in addition to or in place of the loan repayment costs.

The fastest strategy in phased construction is to start deployment with a fixed wireless network. While this will always be slower and less robust than a fiber network, for a minimal cost per household, large numbers of underserved users can be brought online rapidly. Unfortunately, RF propagation is often a hit or

miss depending upon terrain and vegetation and nearby buildings, so it's reasonable to assume that in a cluster of housing units, some will have service, and some will not. However, the deployment costs and timeframe can be relatively low compared to fiber deployments and will throw off reinvestment dollars much faster than any other approach. Once the fixed wireless deployment is stable and positive cash flow, that cash can be used to even out the network either through more fixed wireless deployments or fiber to the home deployments. One additional challenge is that the wireless service may not be as competitive in areas that have cable modem Internet access, potentially both in practice and in marketing materials focused on “up to” speeds.

Alternatively, This area can start with a fiber project in addition to a fixed wireless effort. The fiber project could begin with a more limited budget and build first to the area of the city with the highest demand or to the area with the lowest cost of construction. There are additional ways to finance the network by taking advantage of community members that are the most enthusiastic in the same way water systems have often been financed via assessment districts. This is discussed more significantly in the Guidance and References section.

If the ultimate goal is 100% fiber, as a fiber construction is completed for a specific area, the fixed wireless hardware can be repurposed to cover additional areas to expand the revenue stream to expand the network.

Dealing with ISPs and Bids for Deployment

While we do not claim that our software and analysis methods are 100% accurate, we are extremely confident that we have provided an accurate picture of your potential broadband deployment based on the data that we have, and the analysis we have done.

Our recommendation is to share the information that we have provided in a prospective bid situation, whether it is an advanced design study, or actual project procurement. Based on our experience, including regional providers in your region, we are confident, that the methodology of our approach has given you the best currently available information at the lowest possible cost. Our experience is that what we have provided for you is consistent with the best practices modeling of top tier companies including Samsung, Sprint, Microsoft, Windstream, and many others.

If you move forward with your project, we urge you to share what we have provided to you with your prospective vendors, your team, and residents in your community.

Our combined goal is to provide broadband to everyone. All who are critical of our methods are extremely welcome to critique. We can only improve our quality of service from discovering errors, omissions or criticism of any kind. We urge you to provide this information to all future project participants, and we believe and hope, we have provided them, and you, with the value that we promised.

Next Steps

Our goal is to quickly offer basic guidance and estimates for the costs of various investments to improve Internet access. As you move forward, we suggest additional next steps:

- *Education* – The most successful projects have occurred in areas where local leaders took it upon themselves to deeply understand the opportunities and challenges of improving Internet access. Consulting outside experts should be a part of the process, but every project needs a champion or small team that will become a local expert and take responsibility for vetting options. Education can take many forms, including visiting nearby communities that have solved this problem to meet with the relevant decision-makers. There are a variety of conferences from local regional events to national events where an individual or small group can quickly get up to speed on these discussions and develop a network of others working on similar projects. Ultimately, this should culminate in a vision – an articulated document of what the goals are for any project along these lines. We recommend a tripod of educated support that includes some elected officials, some municipal staff, and representatives of local businesses and residents. Each of these groups should be represented in the process to improve the odds of success.

  The Institute for Local Self-Reliance runs MuniNetworks.org – a news source tracking local government policies to improve Internet access as well as the role of cooperatives in rural areas. It has a newsletter and weekly podcast among other resources.

We encourage you to join Next Century Cities, an organization created specifically to help communities in the situation you are in. There is no cost to join – more details here. Next Century Cities has compiled a very useful toolkit, called Becoming Broadband Ready.

- *Consultants* – As you move forward, you may want to consider a feasibility study or simply some expert hand-holding. Our goal has been to prepare you to have good questions and more information before you engage a consultant. Consultants will be helpful in collecting more information based on your goals and potential models, including issuing an RFP or RFI to gauge the interest of local ISPs in any form of partnership.

- *Survey* – Many consultants will offer a survey to better understand local interest in better Internet access. Are people and businesses frustrated with their current level of service? If so, is it due to speed, prices, customer service, reliability, etc.? Are people excited at the prospect of the favored solution or solutions being contemplated? Do you have a sense of how many people will really sign up for a new service?

- *Public Meetings* – A consultant can also help regarding public meetings to discuss potential investments and gather public feedback. Here again, ILSR or Next Century Cities may also be able supply a speaker to discuss the trade-offs of different approaches and what other communities have seen from their approaches. These meetings frequently give an opportunity for incumbent telephone and cable companies to oppose a contemplated investment, sometimes via proxy people or groups that may make dramatic claims to scare the

public and generate opposition. As such, it is best for these meetings to happen after some significant internal education and planning.

WI PORTAGE WI
BROADBAND INTERNET ACCESS PROJECT
Shaded cells accept inputs

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WHY A LOCAL SOLUTION?

In many industries, market competition ensures good outcomes. Unfortunately, investor-owned cable and internet networks are, and will remain, largely uncompetitive since wired telecommunications networks are a natural monopoly - they have very high upfront capital costs and declining marginal costs. This makes robust competition all but impossible.

State and federal government will not solve the problem

- The Federal government has offered billions of dollars to incumbents like CenturyLink and AT&T with little infrastructure improvement. Despite this funding, in many places, speeds still do not meet the FCC definition of broadband - 25 megabits per second download speed; 3 Mbps upload.
- State government is often too focused on the interests of Big Telecom, protecting large, absentee service providers and taking control from communities.

Why Broadband?

- Faster speeds
- Affordable service
- Reliable performance
- Universal access
- Scalable networks
- Economic development

Large telecom companies refuse to invest in rural areas

- Many ISPs use outdated technology like DSL that does not meet current service demands. These companies do not upgrade infrastructure because they do not have competitors.
- Mobile wireless connections are insufficient for long-term use due to bandwidth caps. Fiber optics are future-proof and affordable with a local business plan.

Local leaders can best resolve local issues

- You know what is best for your community.
- Local leaders can improve internet access in a multitude of ways: 1) institutional networks connect businesses, schools, libraries, governments, and hospitals; 2) municipal fiber networks come in many models as described below. For example, open-access networks allow multiple ISPs to operate on publicly-owned infrastructure, creating competition to improve speeds and lower prices; 3) co-ops are non-profit entities that may already provide utilities like telephone service and electricity; and 4) carrier neutral locations promote collaboration between ISPs by acting as a major connection point. CNLs create savings by lowering infrastructure costs.

TYPES OF MUNICIPAL BROADBAND OPERATING MODELS

Community broadband network operations may be structured in a variety of ways, each with its own strengths and weaknesses. Below are some common approaches, any of which may be tweaked to fit the needs of your particular community.

Full Retail - The municipality offers services directly to the public just like a private company. Most, but not all, of the communities that have used this model already had a municipal electric utility in place. Examples include Chattanooga TN, Wilson NC, Lafayette LA, and Sandy OR.

Dark Fiber - The municipality installs the broadband network and makes it available for lease to ISPs or for future municipal use. This option is generally pursued in a limited area such as a business district, but some communities have used it throughout their jurisdiction. See Stockholm Sweden, Huntsville AL, Rockport ME, and Lincoln NE.

Open Access - The municipality builds and maintains the network infrastructure, making it available to multiple ISPs that compete for subscribers. Examples include UTOPIA in UT, NoaNet in WA, and Ammon ID.

NETWORK FINANCING STRATEGIES

Over 400 local governments across the U.S. offer internet access to local businesses or residents, often in reaction to a lack of fast, affordable, and reliable connections in their community from investor-owned providers. Though private service providers may get away with regular price hikes and cross-border subsidies, elected officials are accountable to citizens and reluctant to raise taxes, consequently most municipal networks have not been financed with tax dollars, rather they have used one or a combination of the three methods below.

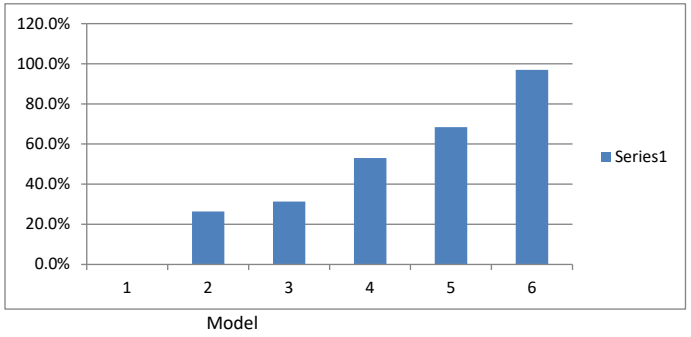
Revenue Bonds - A municipality issues bonds to, or leases assets from, private investors and the obligations are then repaid with revenues from the network. Municipal credit quality is quite high - less than 2% of municipal networks have defaulted - but municipal finance rules vary by location. For example, in Minnesota, if network service fees cover at least 75% of the annual debt service, bonds may be issued as general obligations without the need for a bond election. Examples include Lafayette LA, Cedar Falls IA, and Longmont CO.

Internal Loans - One department within the municipality lends another the necessary capital for building the network. Many states regulate the minimum interest rate and other requirements for such a loan. Examples include Chattanooga TN, Spanish Fork UT, and Auburn IN.

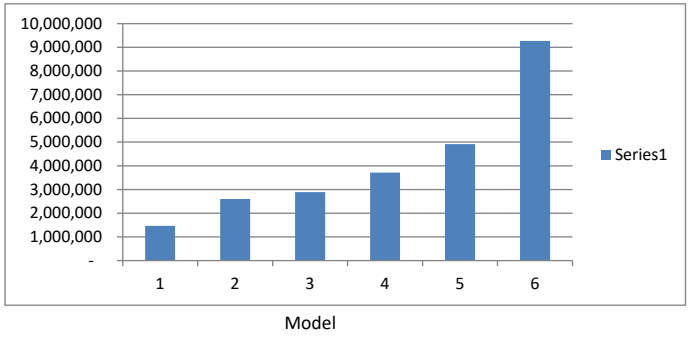
Avoided Cost - Funding used to lease connections from existing providers is re-directed towards building and operating a municipal network, often resulting in faster connections at lower prices. If payback is longer than one year, bonds may be issued and repaid with the leased lines budget. This approach is most common with smaller networks built incrementally. Examples include Santa Monica CA and Scott County MN.

Summary Charts

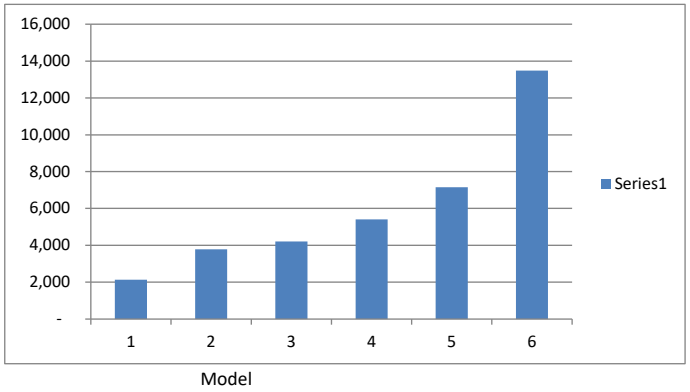
Percent Fiber



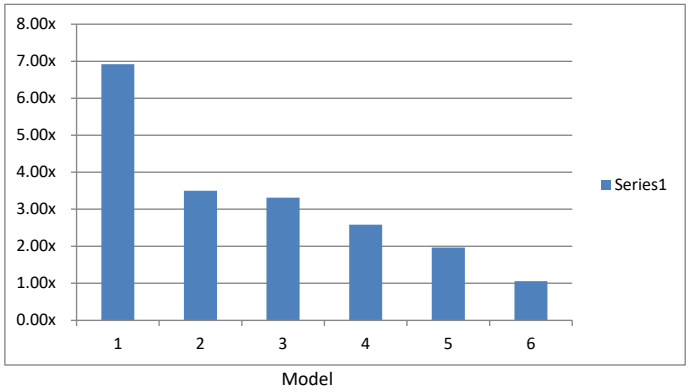
Fiber Cost



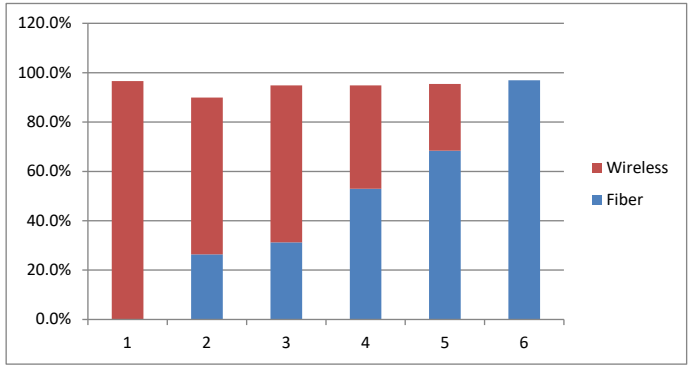
cost/household



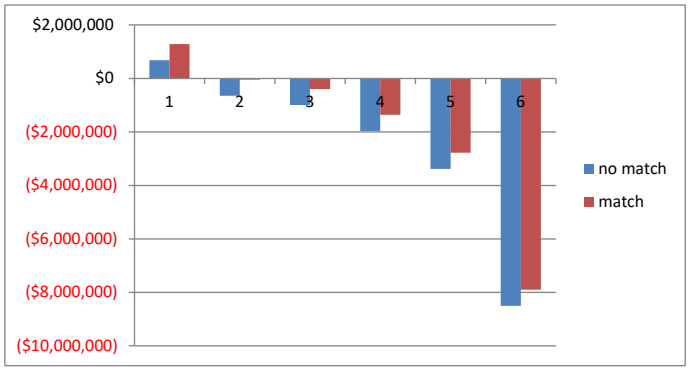
Debt Service



Coverage



Delta of BEAD



WI PORTAGE WI
BROADBAND INTERNET ACCESS PROJECT
SYSTEM DESIGN & COST ALTERNATIVES

Shaded cells accept inputs

last update 2/27/24 11:34 AM

Area	Municipality	State
Name	WI Portage	WI
Total population		1,439
Total households		687
Total square miles		57
Green system design		**C3**
Cost/household		$4,960
Cost/Covered household		$5,226
Coverage %		94.9%
Fully Burdened Cost		$3,407,200

Installed capital costs	Cost/unit	Percent
Aerial fiber ($/mile)	$75,000	50%
Trenched fiber ($/mile)	$75,000	50%
bored ($/mile)		0%
80 ft tower ($/tower)	35,000	100%
Fiber connection($/user)	1,500	
NAP per each	3,000	
FDH per each	60,000	
fixed CPE	250	
wireless CPE	650	4 sectors/tower
base backhaul	110,000	$12,500.00 cost/sector

Depreciation	% of cost	Period
Fiber cable	95%	30 yrs
Fiber equipment	5%	5 yrs
Tower poles	5%	30 yrs
Tower equipment	95%	5 yrs
Capitalized interest	100%	20 yrs
Capitalized project costs	100%	20 yrs

Least fiber, most wireless ←←←←← ***Broadband technology spectrum*** →→→→→ ***Most fiber, least wireless***

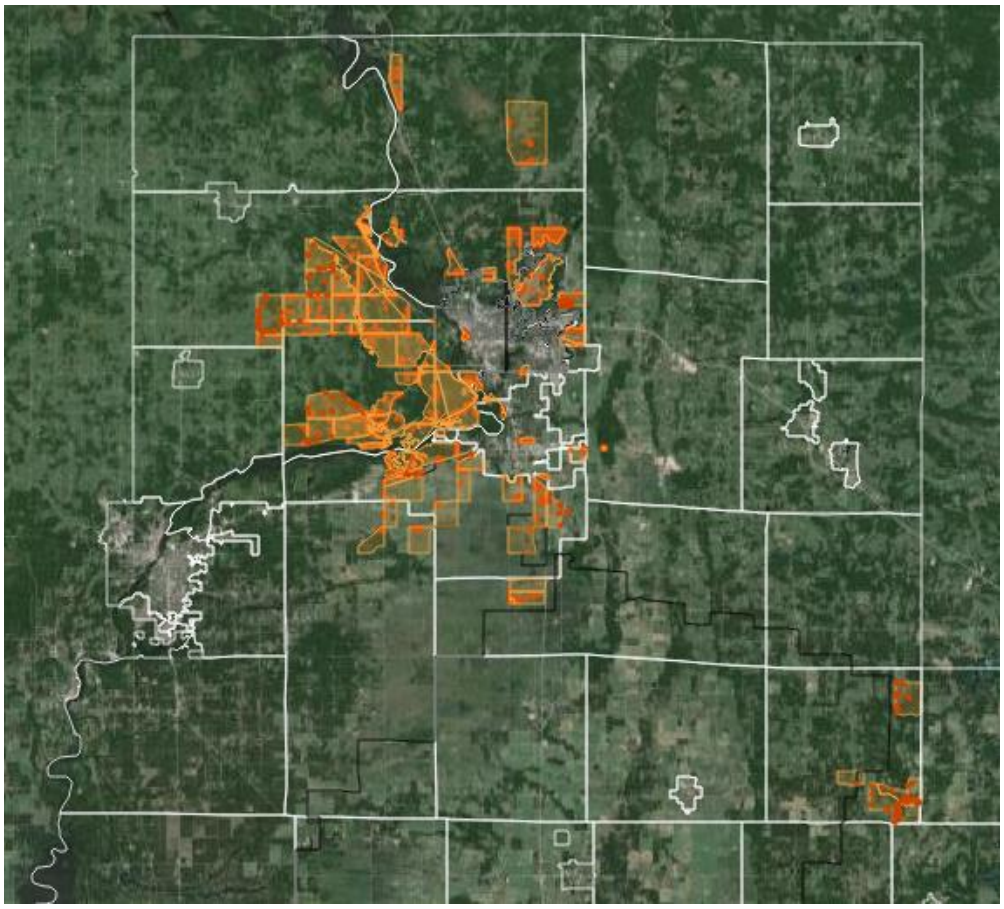
System Name	**A1**	**B2**	**C3**	**D4**	**E5**	**F6**
System Design & Construction						
Max FTTP (ft)	-	600	**800**	1,000	1,500	10,000
Future-proof rating (note 1)	-	26	**31**	53	68	97
Fiber households (#)	-	181	**215**	364	470	666
NAP		19	**22**	37	47	67
FDH		1	**1**	2	2	2
Wireless households (#)	687	506	**472**	323	217	21
Covered households (#)	664	437	**437**	288	186	-
Coverage fiber (miles)	-	12	**16**	26	43	110
Backhaul fiber (miles)						
Total fiber (miles)	-	12	**16**	26	43	110
Total towers (#)	12	12	**12**	11	9	-
Fiber coverage rate	0.0%	26.3%	**31.3%**	53.0%	68.4%	96.9%
Wireless coverage rate	96.7%	63.6%	**63.6%**	41.9%	27.1%	0.0%
Combined coverage rate	96.7%	90.0%	**94.9%**	94.9%	95.5%	96.9%
Uncovered households (#)	23	69	**35**	35	31	21
Capital Costs & Depreciation						
Fiber cost ($)	-	1,064,000	**1,345,000**	2,200,000	3,549,000	8,664,000
Tower cost with CPEs($)	1,341,000	1,289,000	**1,279,000**	1,140,000	919,000	7,000
Connection Costs ($)	-	122,175	**145,125**	245,700	317,250	449,550
Capitalized interest ($)	14,000	11,000	**12,000**	15,000	20,000	39,000
System cost ($)	1,465,000	2,596,175	**2,891,125**	3,710,700	4,915,250	9,269,550
Cost/covered household ($)	2,132	3,779	**4,208**	5,401	7,155	13,493
Annual depreciation expense ($)	156,917	302,092	**313,133**	325,417	344,167	400,342
Wtd avg depreciation period	6.33 yrs	9.27 yrs	**9.96 yrs**	12.29 yrs	15.39 yrs	24.96 yrs
Comparison						
Key Constants (2)						
Residential subscription rate	0	45.0%	**45.0%**	45.0%	45.0%	45.0%
Residential broadband service	50.00	50.00	**50.00**	50.00	50.00	50.00
Residential network access fee	12.50	12.50	**12.50**	12.50	12.50	12.50
Total residential service price ($/mo/sub)	62.50	62.50	**62.50**	62.50	62.50	62.50
ISP network access fee	27.50	27.50	**27.50**	27.50	27.50	27.50
Key Results						
Municipality						
Avg debt service coverage, yrs 1 to 5	6.92x	3.50x	**3.31x**	2.58x	1.96x	1.06x
Avg debt service coverage, yrs 6 to 20	7.70x	3.89x	**3.69x**	2.87x	2.18x	1.18x
Monthly debt service/household ($)	3.63	6.46	**7.20**	9.23	12.23	23.06
Internet Service Providers						
5 yr internal rate of return	49.49%	88.92%	90.31%	90.31%	90.46%	90.81%

Notes

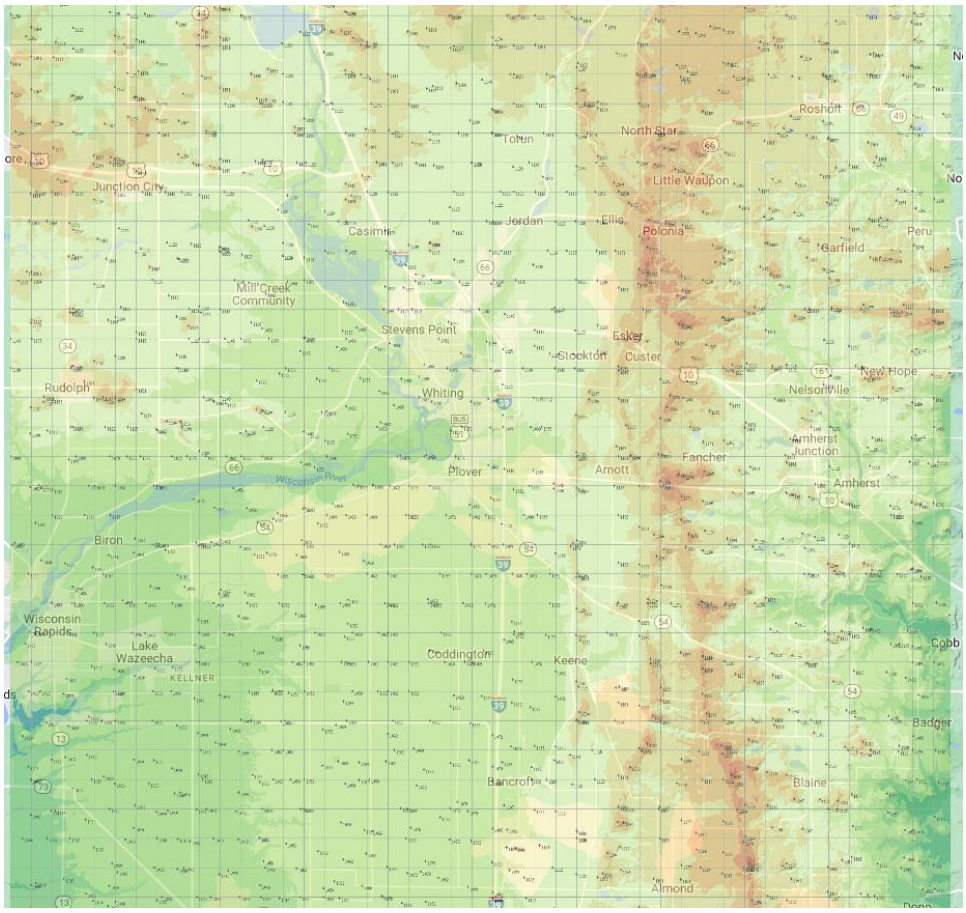
1 - Future-proof rating ranges from 0 to 100 and indicates estimated percentage of system not subject to likely technological obsolescence within 5 years.
2 - Assumes no growth from year 0 base.

Fully burdened		1,725,038	3,056,996	3,404,300	4,369,349	5,787,707	10,914,895
% of BEED funding		71.59%	126.86%	141.28%	181.33%	240.19%	452.96%
over/under		$684,622	($647,337)	($994,640)	($1,959,690)	($3,378,048)	($8,505,236)
over/under with match		$1,287,037	($44,922)	($392,226)	($1,357,275)	($2,775,633)	($7,902,821)
State estimated	$2,409,659						
match	$602,415						
net	$3,012,074						

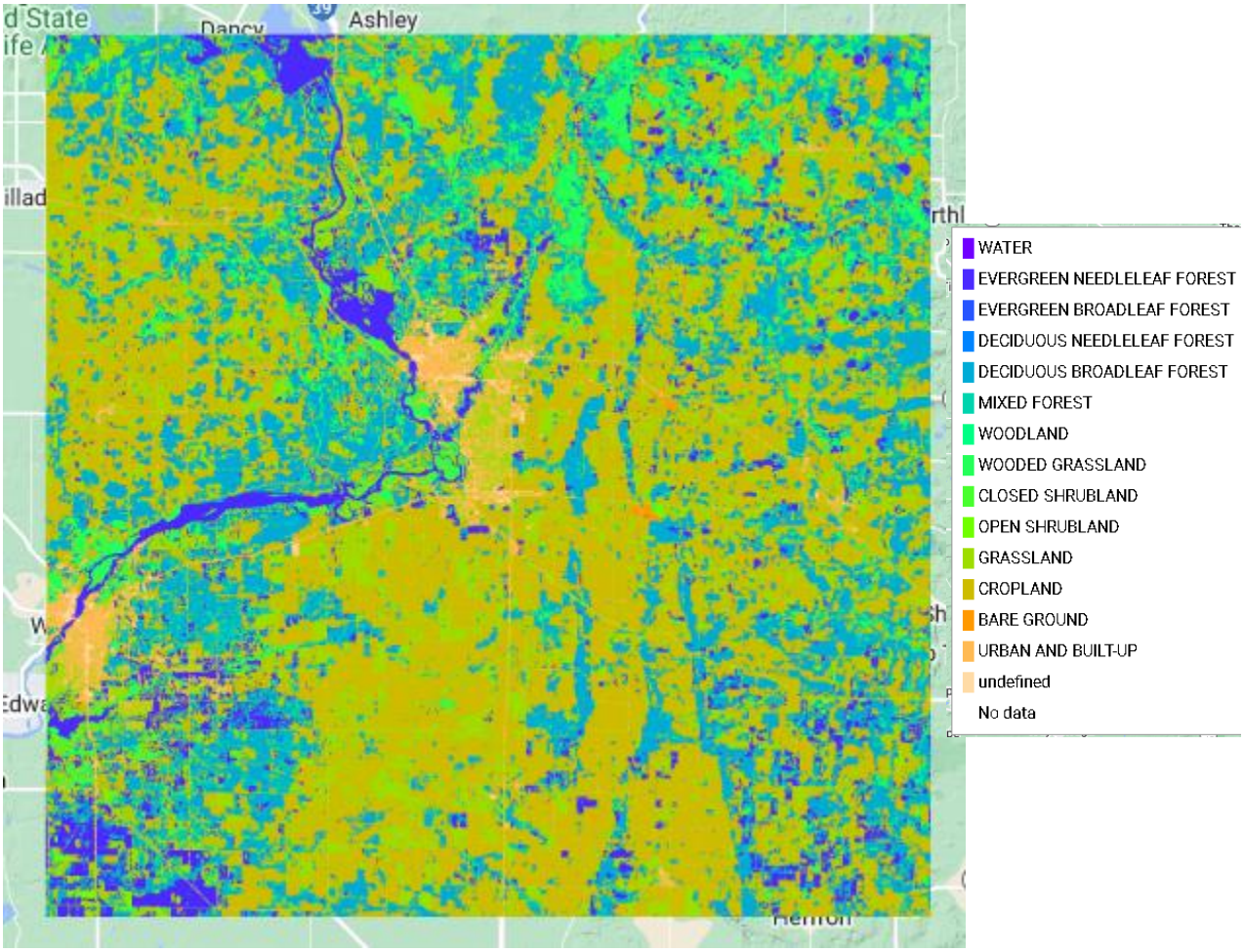
Un/Underserved BSL



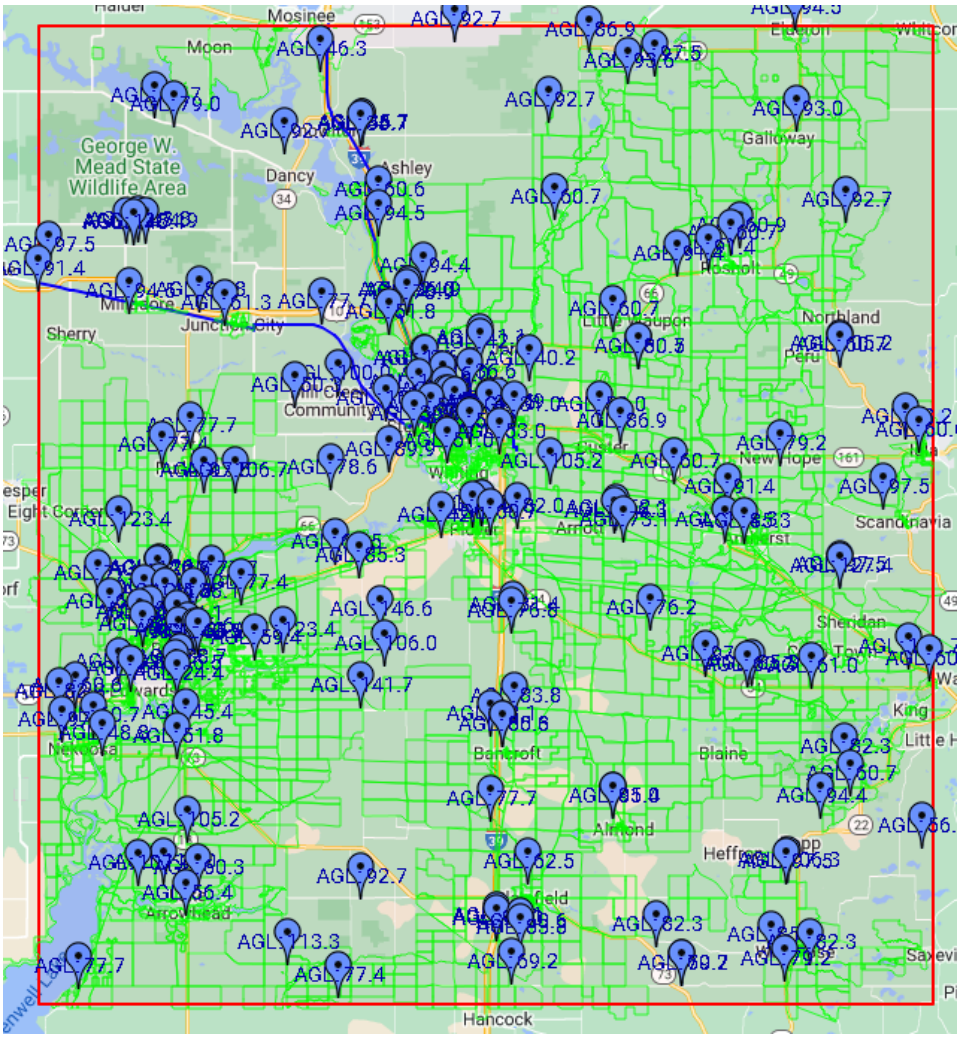
Reference Elevation Map



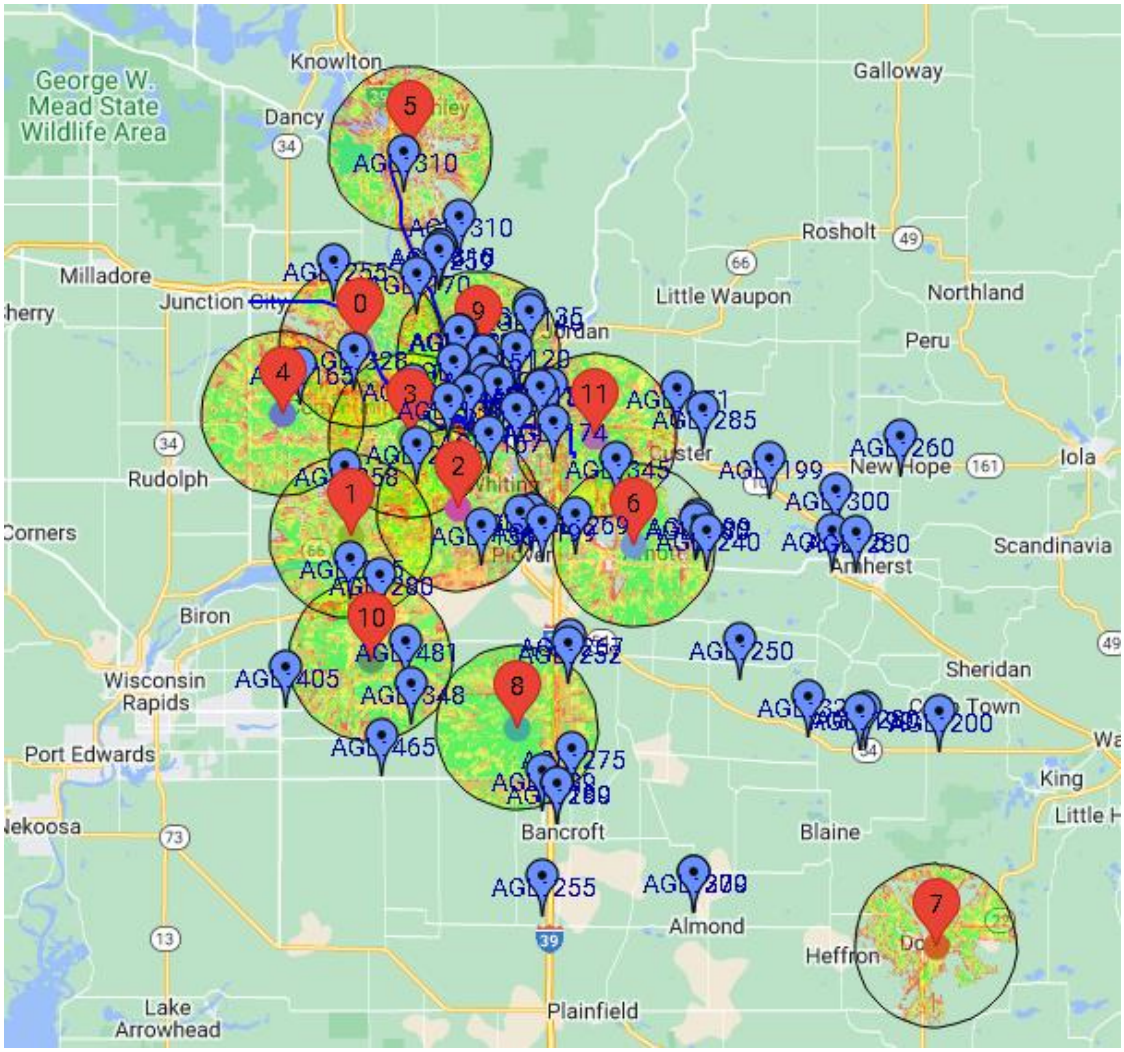
Reference Clutter Map



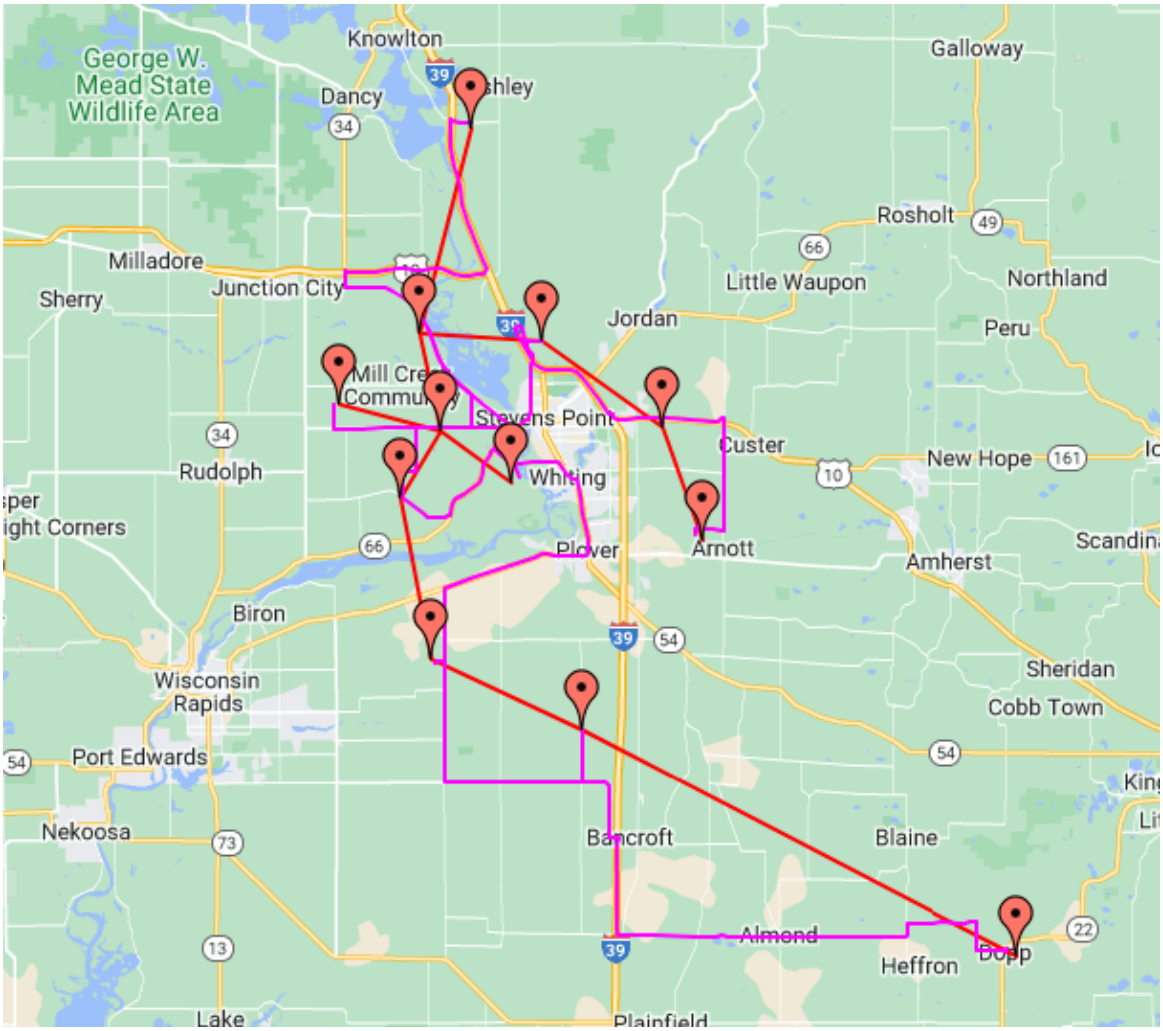
Public Domain Known Fiber Locations and Towers



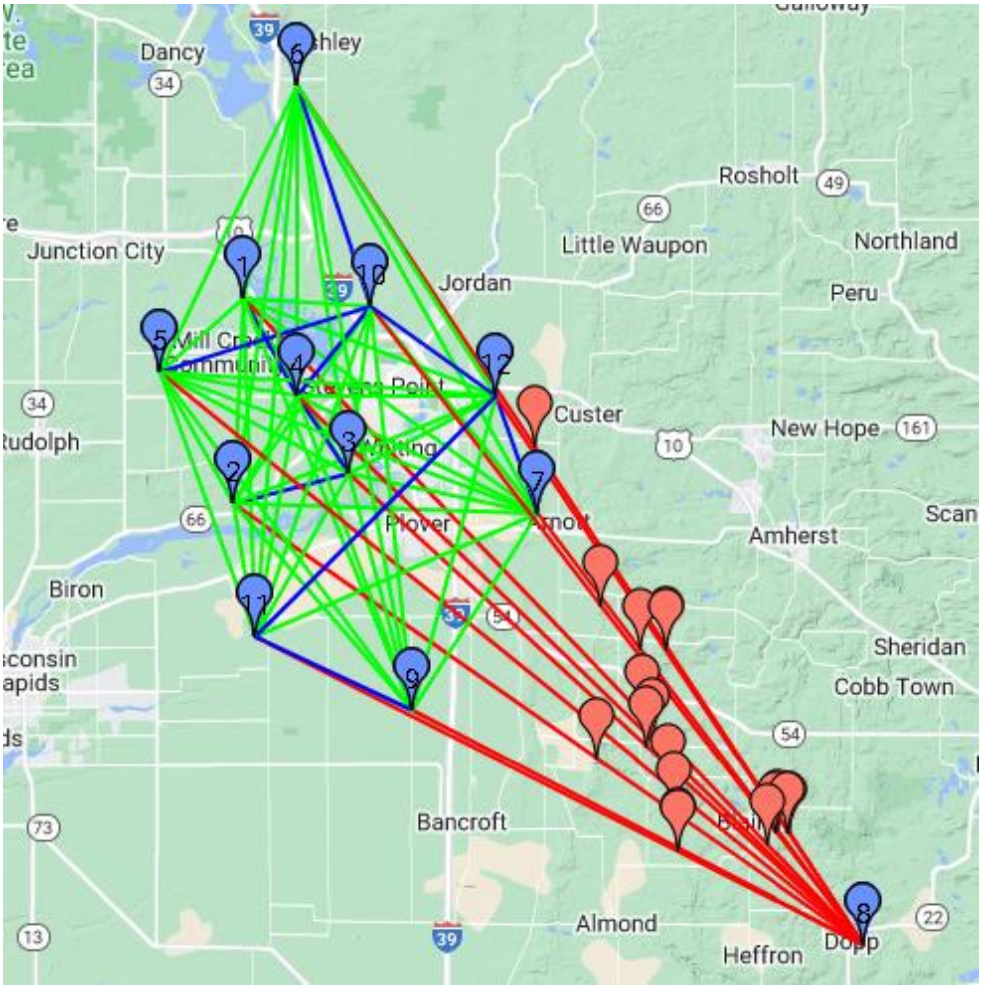
Pure Fixed Wireless Design



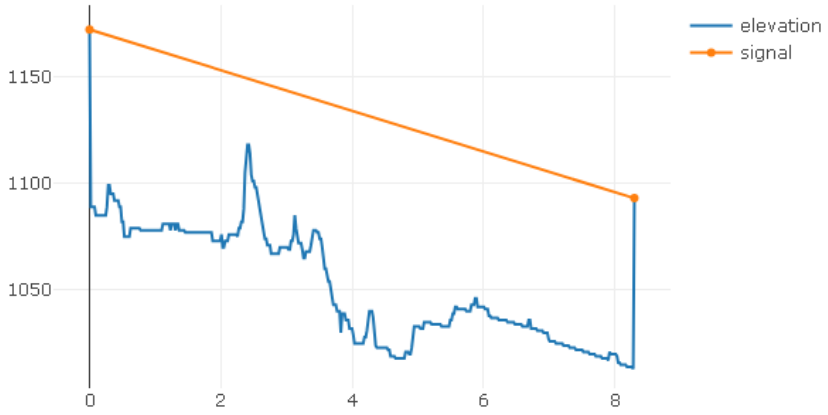
Tower Fiber Routes Hybrid Design – 115 miles



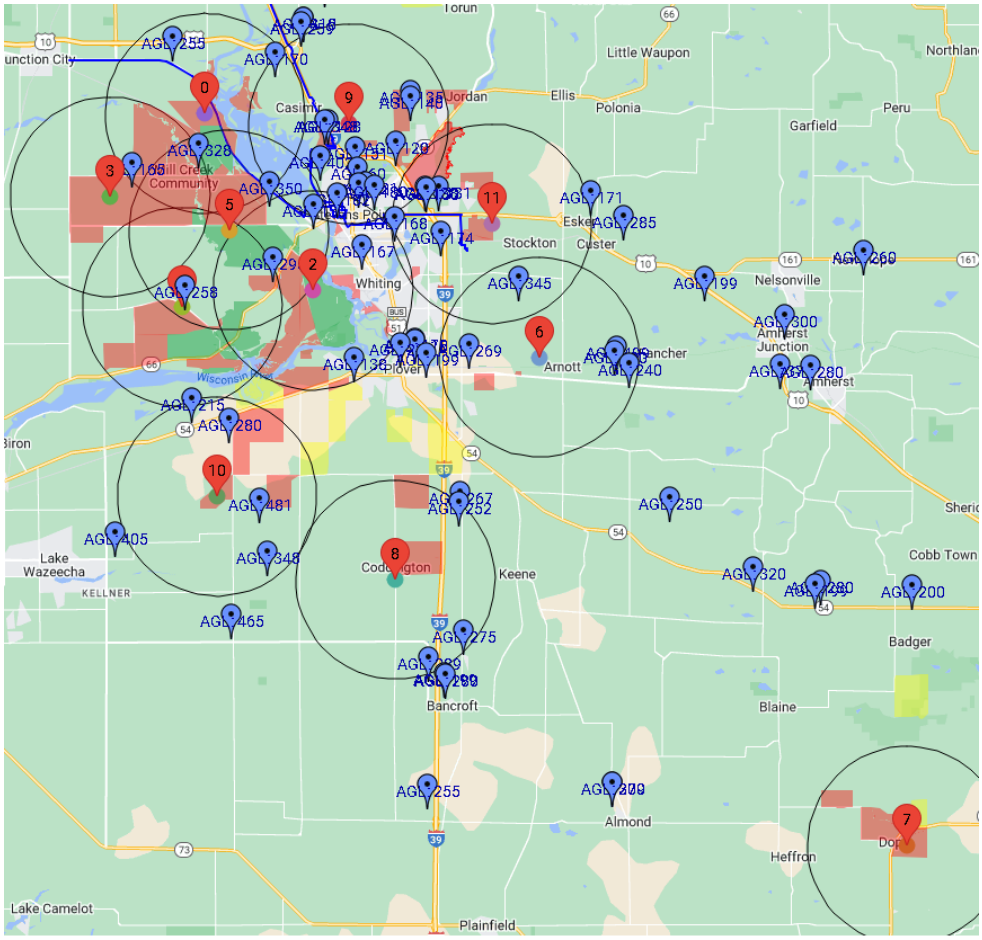
Tower Line of Sight Pure Fixed Wireless Design



Relative Elevations



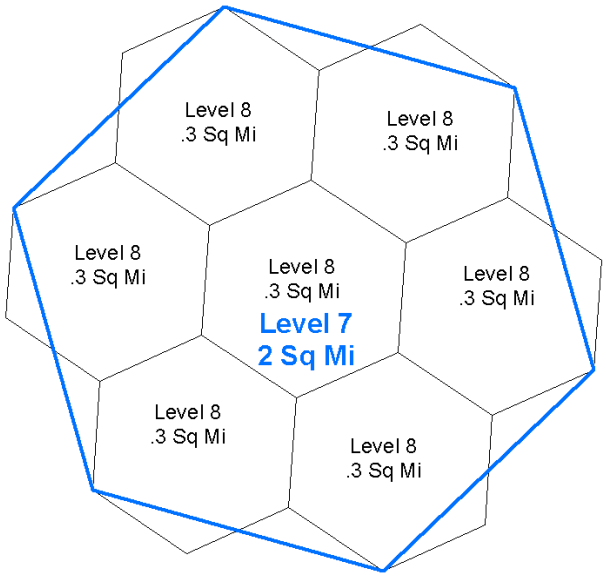
Recommended Hybrid Design



B. BROADBAND MAPS

Mapping Process

Much of the data on the maps are displayed using hexbin geometry used on the FCC broadband maps. The FCC collected data from providers on coverage and broadband type by this geometry. Level 7 is 2 square miles in size and Level 8 is .3 square miles in size. See the graphic below.



Map 1- Broadband Serviceable Locations (BSL)

Summary of development patterns and density. Centroids of tax parcels with improvement values greater than zero were summarized within level 8 hexbins. Summary of the total number of centroids counted by hexbins displayed on the map.

Map 2a - Managed Forest Lands (MFL)

Summary of large areas of managed forest lands. Tax parcels coded in a MFL programs were union with hexbins level 8. If greater than 75% of the area of hexbins level 8 was in MFL they are displayed on the map

Map 2b – Assessed Agricultural Lands

Summary of large areas of assessed agricultural lands. Tax parcels coded with an assessment code of agriculture were in union with hexbins level 8. If greater than 25% of the area of hexbins level 8 was assessed agriculture, they are displayed on the map.

Map 2c – Assessed Tax Exempt Lands

Summary of large areas of tax-exempt lands. Tax parcels coded with an assessment code for tax-exempt status were union with hexbins level 8. If greater than 50% to 75% and greater than 75% of the area of hexbins 8 was assessed tax exempt are displayed on the maps

Map 3 – Critical Facilities

Summary of critical facilities. Airports, Ambulance Service, Fire Stations, Hospitals, Health Services, Business and Industrial Parks, Campgrounds, city, village, and town facilities, schools, correctional facilities, DNR Ranger Stations, Emergency Operation Centers, Libraries, Nursing Homes, Post Offices, and Tech Colleges. Summarized within hexbins level 7.

Map 4a- Rural Digital Opportunity Fund (RDOF)

Census blocks of areas covered by the Rural Digital Opportunity Fund program. Provided to areas that lacked 25/3 Mbps fixed broadband service. 40 percent deployment by 2025, 60 percent by 2026, 80 percent by 2027, and 100 percent by 2028.

Map 4b- Existing Grant Areas

Wisconsin Public Service (WPS) existing broadband grant footprint locations 2014 to 2022

Map 5a- Broadband Availability Copper

Summary of FCC reported copper broadband availability. Copper broadband refers to a type of internet connection that utilizes copper-based infrastructure, primarily copper telephone lines, to deliver internet services to users' homes or businesses. The most common technology associated with copper broadband is Digital Subscriber Line (DSL). DSL technology enables the simultaneous transmission of voice and data signals over the same copper line by utilizing different frequency bands. DSL comes in different variants, such as ADSL (Asymmetric DSL) and VDSL (Very-high-bit-rate DSL), offering varying speeds and capabilities Areas reported at level 8 hexbins.

Map 5b- Broadband Availability Cable

Summary of FCC reported cable broadband availability. Cable internet, also known as broadband cable or cable broadband, refers to a high-speed internet connection that utilizes the same coaxial cable infrastructure that delivers cable television signals to homes and businesses. This type of internet connection offers faster speeds compared to traditional dial-up and DSL (Digital Subscriber Line) connections. Areas reported at level 8 hexbins.

Map 5c- Broadband Availability Fiber

Summary of FCC reported fiber broadband availability. Fiber internet, also known as fiber-optic internet, is a high-speed broadband internet connection that utilizes fiber-optic cables to transmit data at incredibly fast speeds. Fiber-optic technology employs thin strands of glass or plastic fibers to carry digital information as pulses of light, enabling faster and more reliable data transmission compared to traditional copper-based cables. Areas reported at level 8 hexbins.

Map 5d- Broadband Availability Fixed Wireless

Summary of FCC reported fixed wireless broadband availability. Fixed wireless broadband is a type of high-speed internet connection that utilizes wireless communication technology to provide internet access to homes, businesses, and other locations. Unlike mobile wireless connections, which are designed for on-the-go access, fixed wireless connections are stationary and provide consistent connectivity to a specific location. Areas reported at level 8 hexbins.

Map 5e- Broadband Availability Mobile

Summary of FCC reported mobile broadband availability. Mobile broadband refers to high-speed internet access provided through wireless networks, enabling users to connect to the internet using mobile devices such as smartphones, tablets, laptops, and other portable devices. Unlike fixed broadband connections, which are typically stationary and serve specific locations, mobile broadband provides on-the-go connectivity, allowing users to access the internet from virtually anywhere within the coverage area of a mobile network. 4G and 5G areas are summarized at hexbins level 7 hexbins.

Map 6- Average Download Speeds (may split 6a and 6b for Fixed and Mobile)

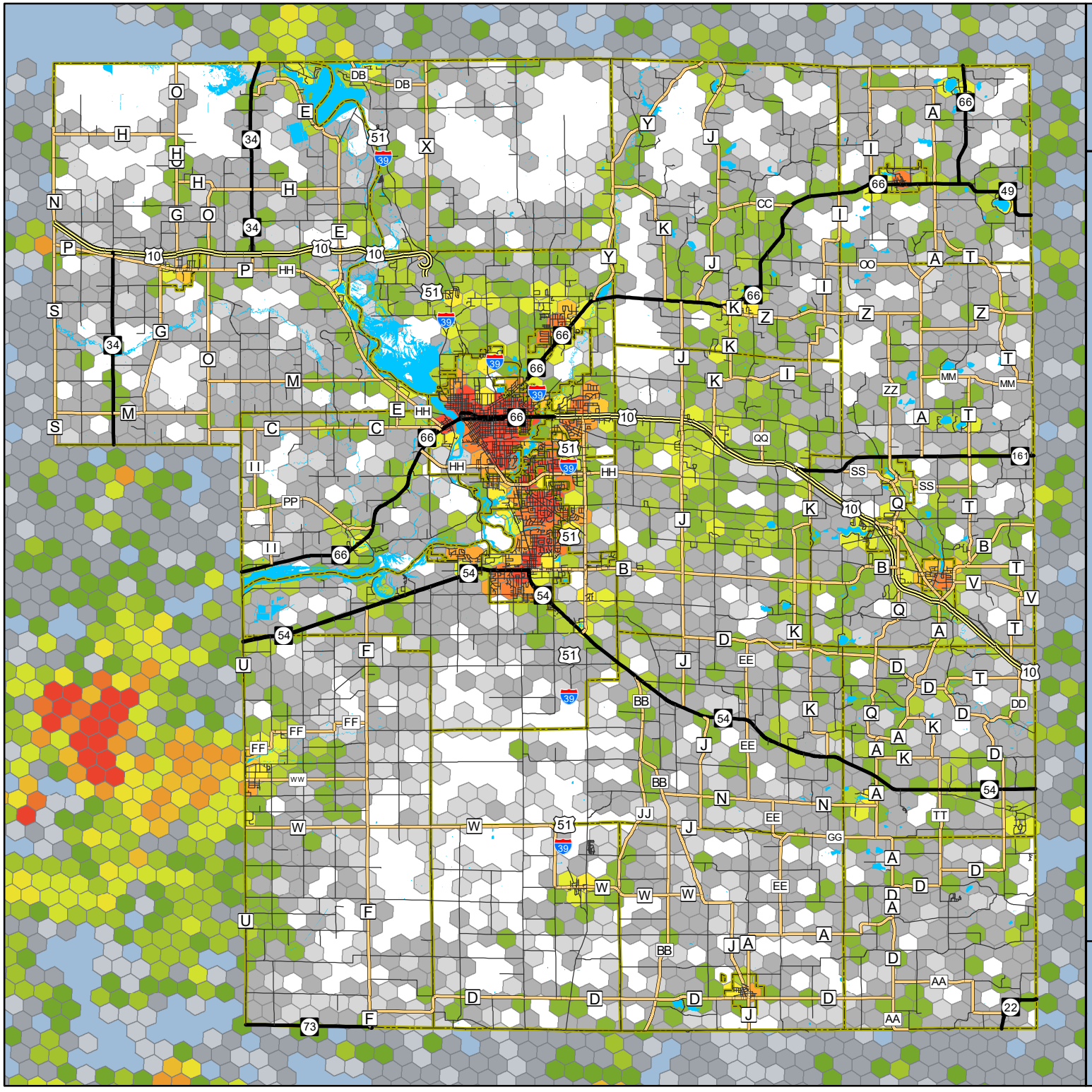
Information was collected from wisconsinspeedtest.net and Ookla Open Data speed tests. These areas are summarized at level 7 hexbins. Areas that reported no service are highlighted.

Map 7- Average Upload Speeds (may split 7a and 7b for Fixed and Mobile)

Information was collected from wisconsinspeedtest.net and Ookla Open Data speed tests. These areas are summarized at level 7 hexbins.

Map 8- Recommended Broadband Expansion Areas

Areas determined by existing data and committee input for potential project locations.



Map 1 **DRAFT**

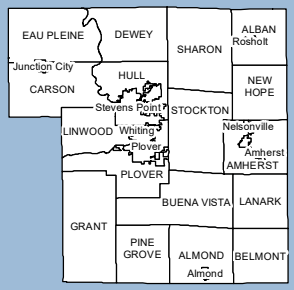
Broadband Serviceable Locations (BSL)

Portage County, Wisconsin

- Minor Civil Divisions
- U.S. Highway
- State Highway
- County Highway
- Local Road
- Water

Count

- 1
- 2 - 5
- 6 - 10
- 11 - 25
- 26 - 50
- 51 - 75
- 76 - 100
- 101 - 150
- 151 - 200
- > 200



Source: WI DNR, NCWRPC, Portage Co, WisDOT, FCC

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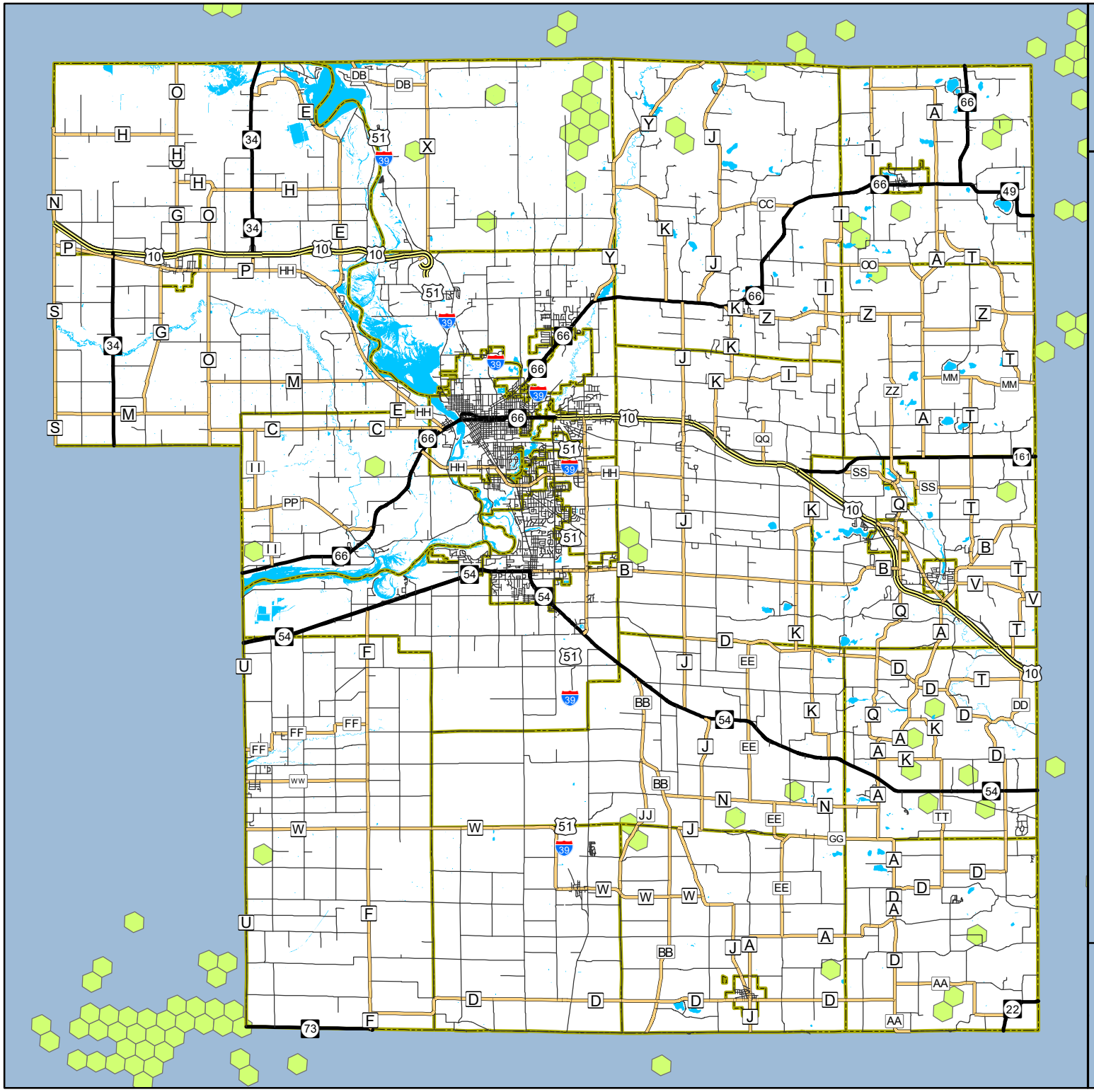
North Central Wisconsin Regional Planning Commission
210 McClellan St., Suite 210, Wausau, WI 54403
715-849-5510 - staff@ncwrpc.org - www.ncwrpc.org

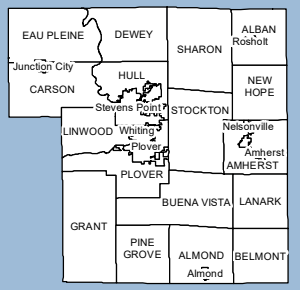
Map 2a **DRAFT**

Managed Forest Lands (MFL)

Portage County, Wisconsin



- Minor Civil Divisions
- U.S. Highway
- State Highway
- County Highway
- Local Road
- Water
- > 75 % MFL



Source: WI DNR, NCWRPC, Portage Co, WisDOT, FCC

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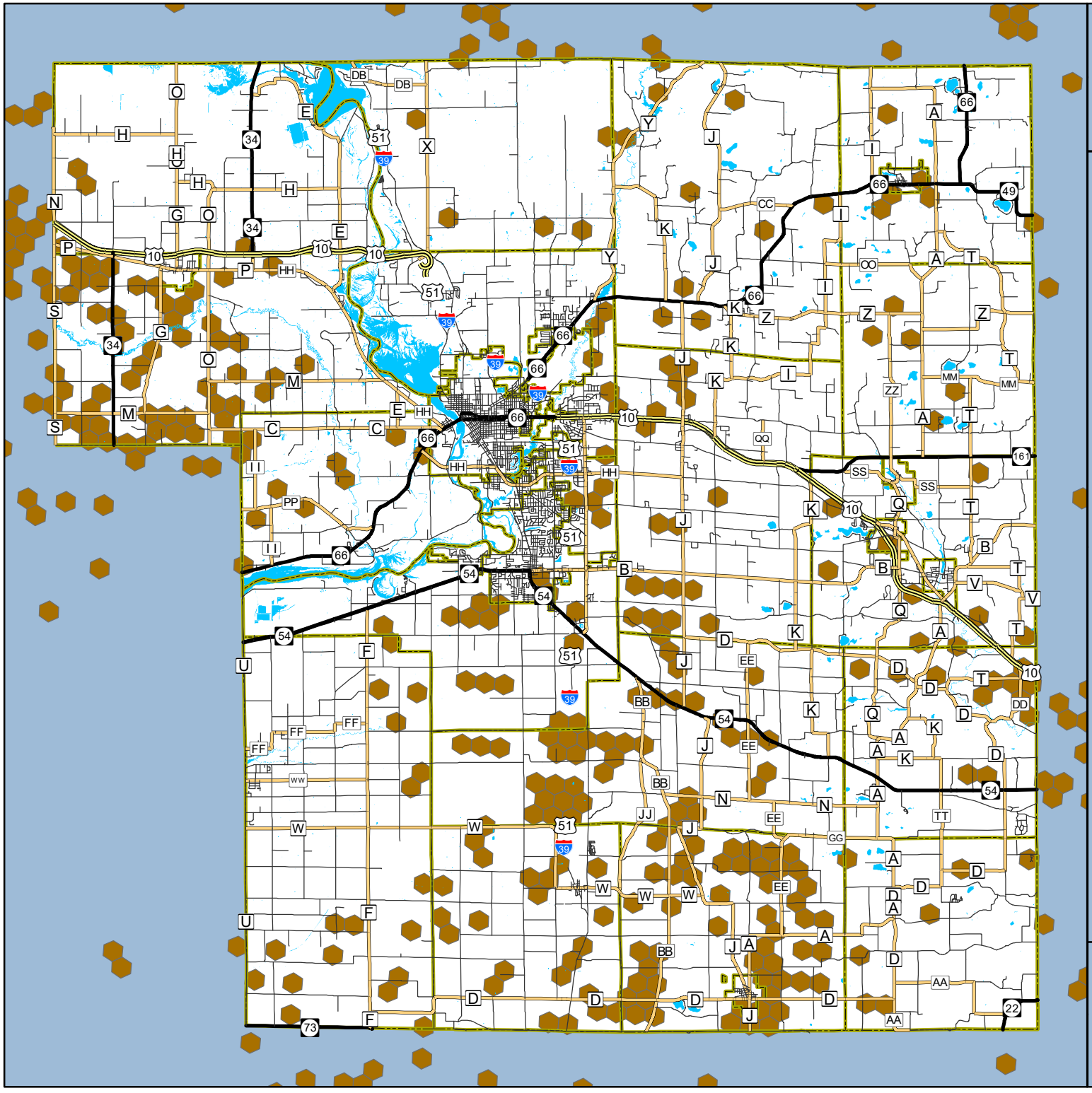
North Central Wisconsin Regional Planning Commission
210 McClellan St., Suite 210, Wausau, WI 54403
715-849-5510 - staff@ncwrpc.org - www.ncwrpc.org

Map 2b **DRAFT**

Assessed Agricultural Lands

Portage County, Wisconsin



- Minor Civil Divisions
- U.S. Highway
- State Highway
- County Highway
- Local Road
- Water
- > 25% Agricultural Lands

Source: WI DNR, NCWRPC, Portage Co, WisDOT, FCC

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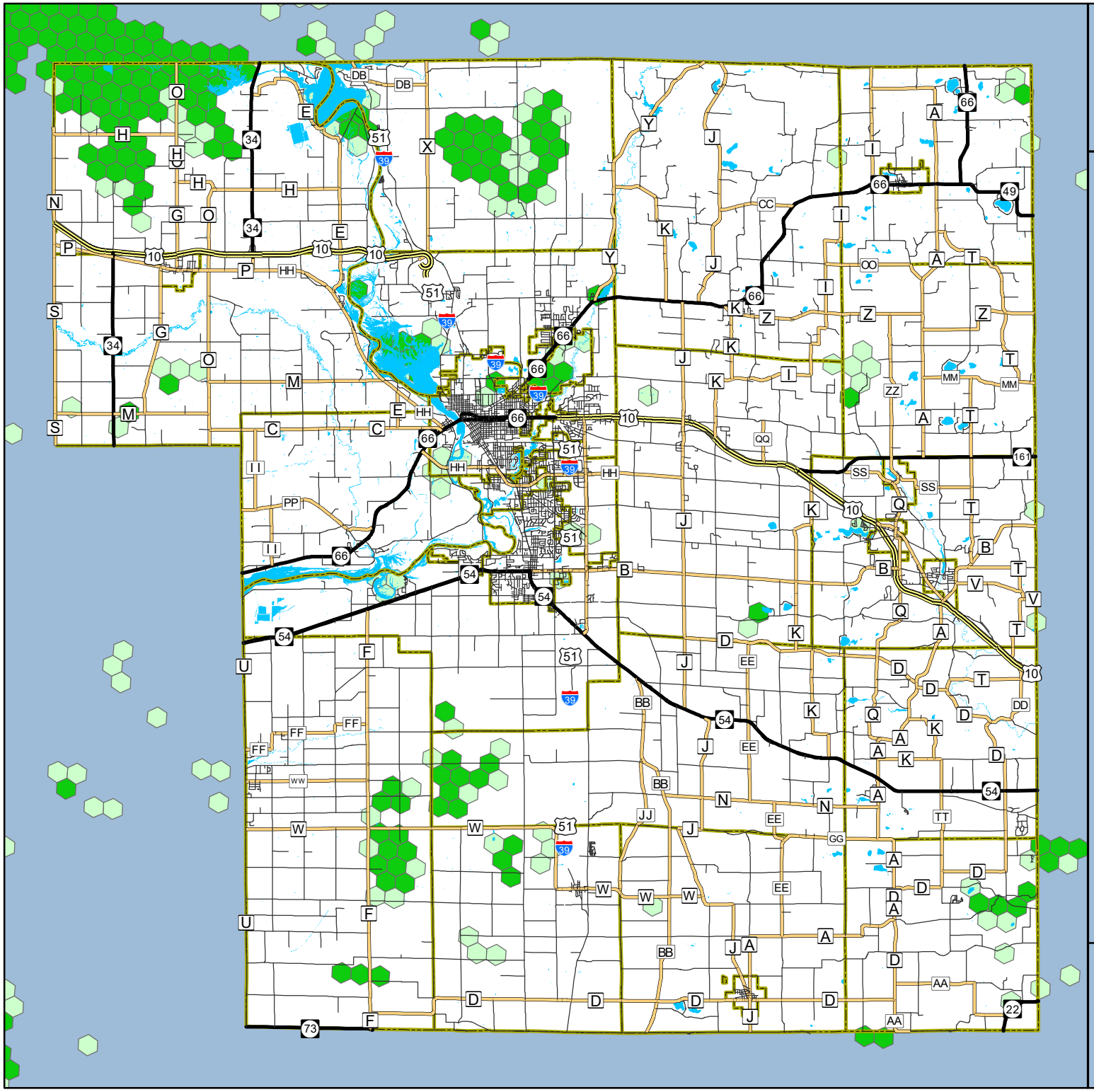


Map 2c **DRAFT**

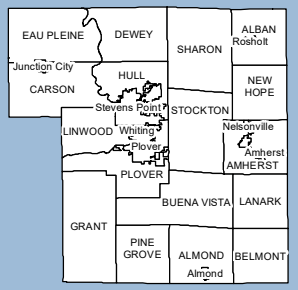
Assessed Tax Exempt Lands

Portage County, Wisconsin

- Minor Civil Divisions
- U.S. Highway
- State Highway
- County Highway
- Local Road
- Water

Tax Exempt

- 50 to 75%
- > 75%



Source: WI DNR, NCWRPC, Portage Co, WisDOT, FCC

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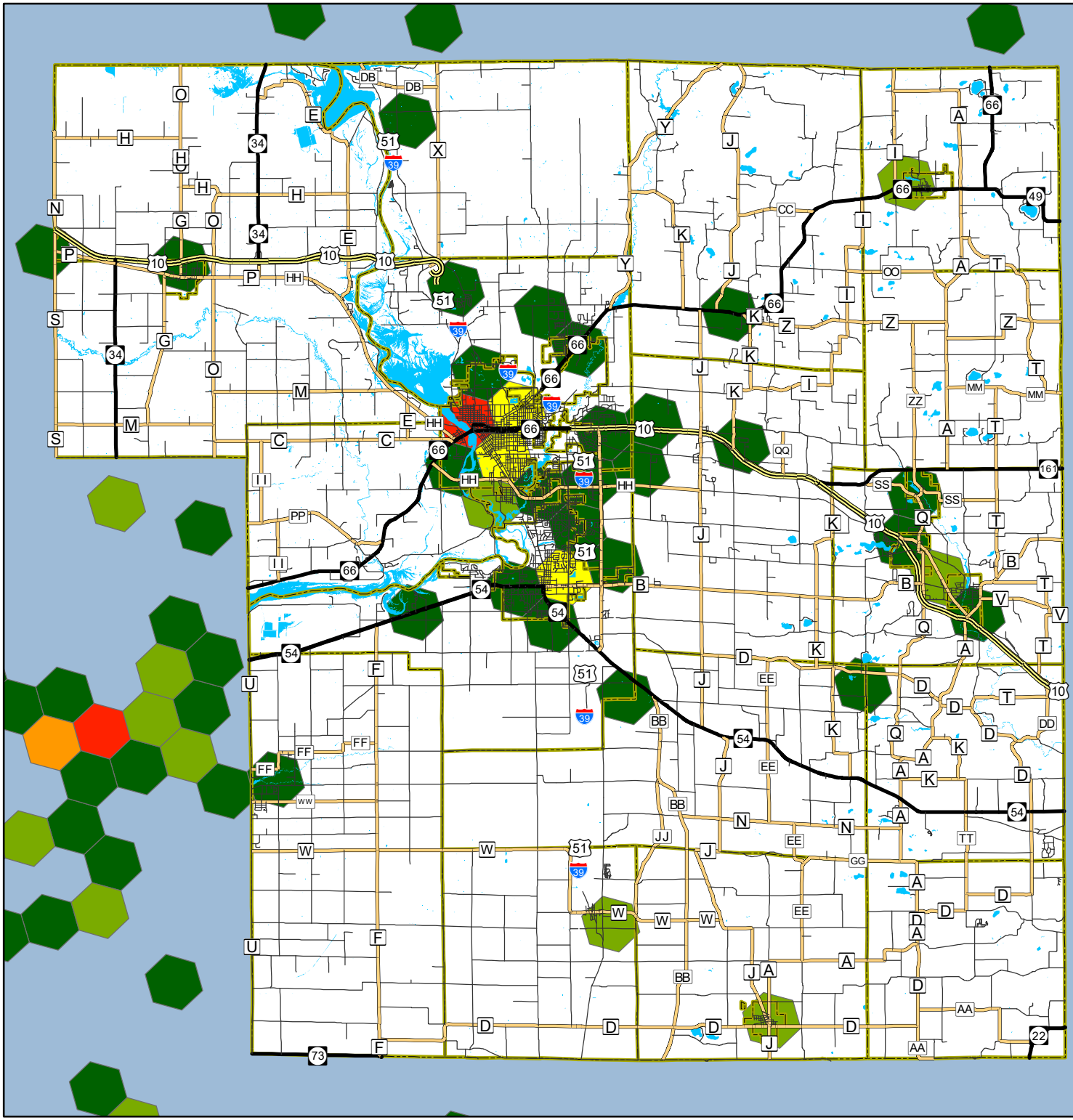
210 McClellan St., Suite 210, Wausau, WI 54403
715-849-5510 - staff@ncwrpc.org - www.ncwrpc.org

Map 3 **DRAFT**

Critical Facilities

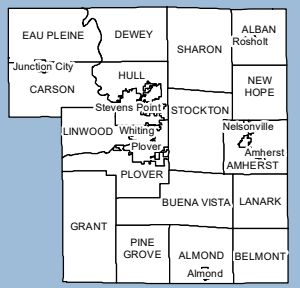
Portage County, Wisconsin



- Minor Civil Divisions
- U.S. Highway
- State Highway
- County Highway
- Local Road
- Water

Count

- 1 - 2
- 3 - 5
- 6 - 8
- 9 - 12
- 13 - 20



Source: WI DNR, NCWRPC, Portage Co, WisDOT, FCC

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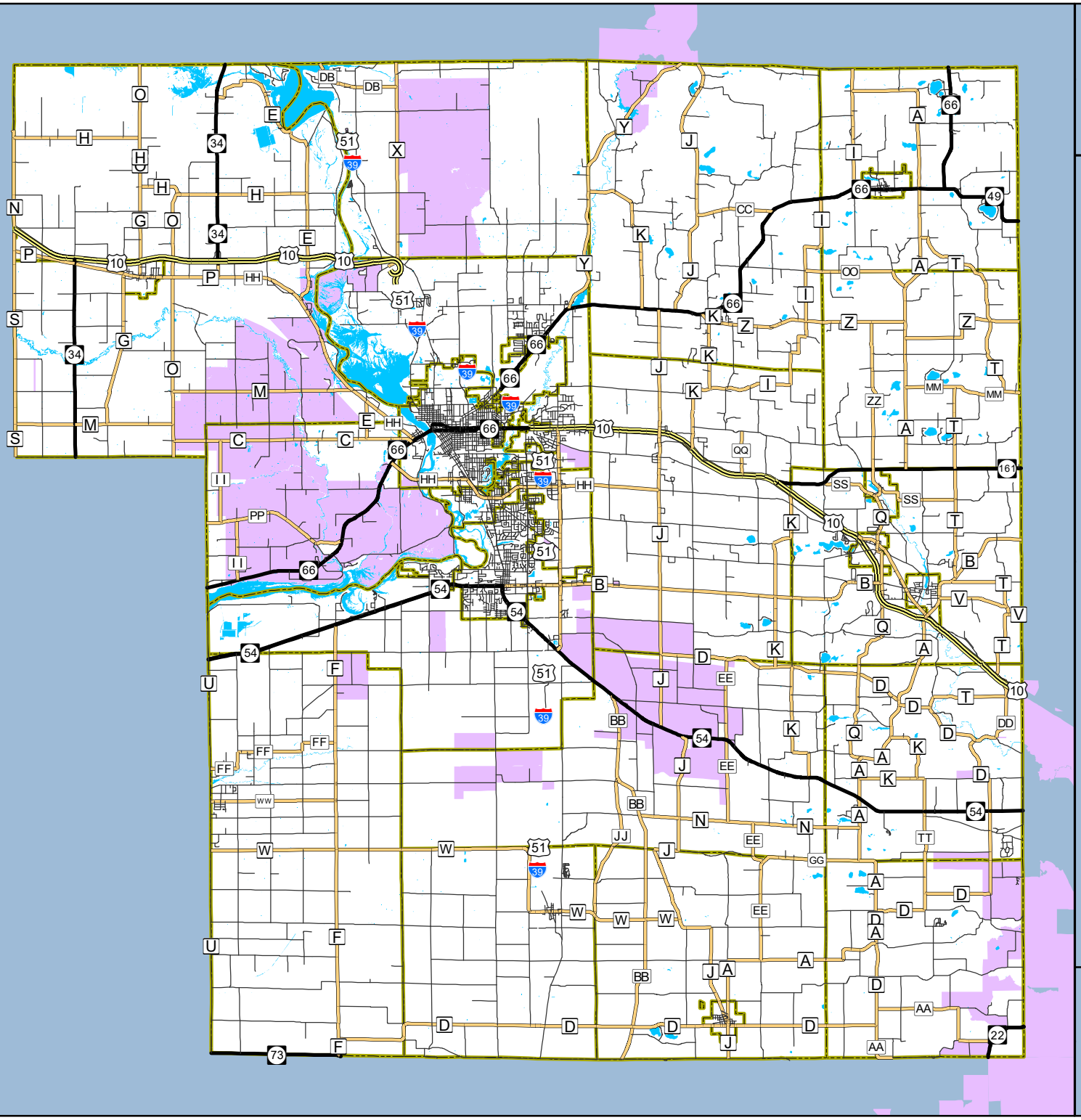
210 McClellan St., Suite 210, Wausau, WI 54403
715-849-5510 - staff@ncwrpc.org - www.ncwrpc.org

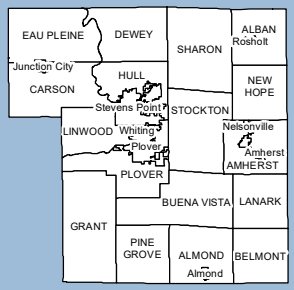
Map 4a **DRAFT**

Rural Digital Opportunity Fund (RDOF)

Portage County, Wisconsin



- Minor Civil Divisions
- U.S. Highway
- State Highway
- County Highway
- Local Road
- Water
- RDOF Areas



Source: WI DNR, NCWRPC, Portage Co, WisDOT, FCC

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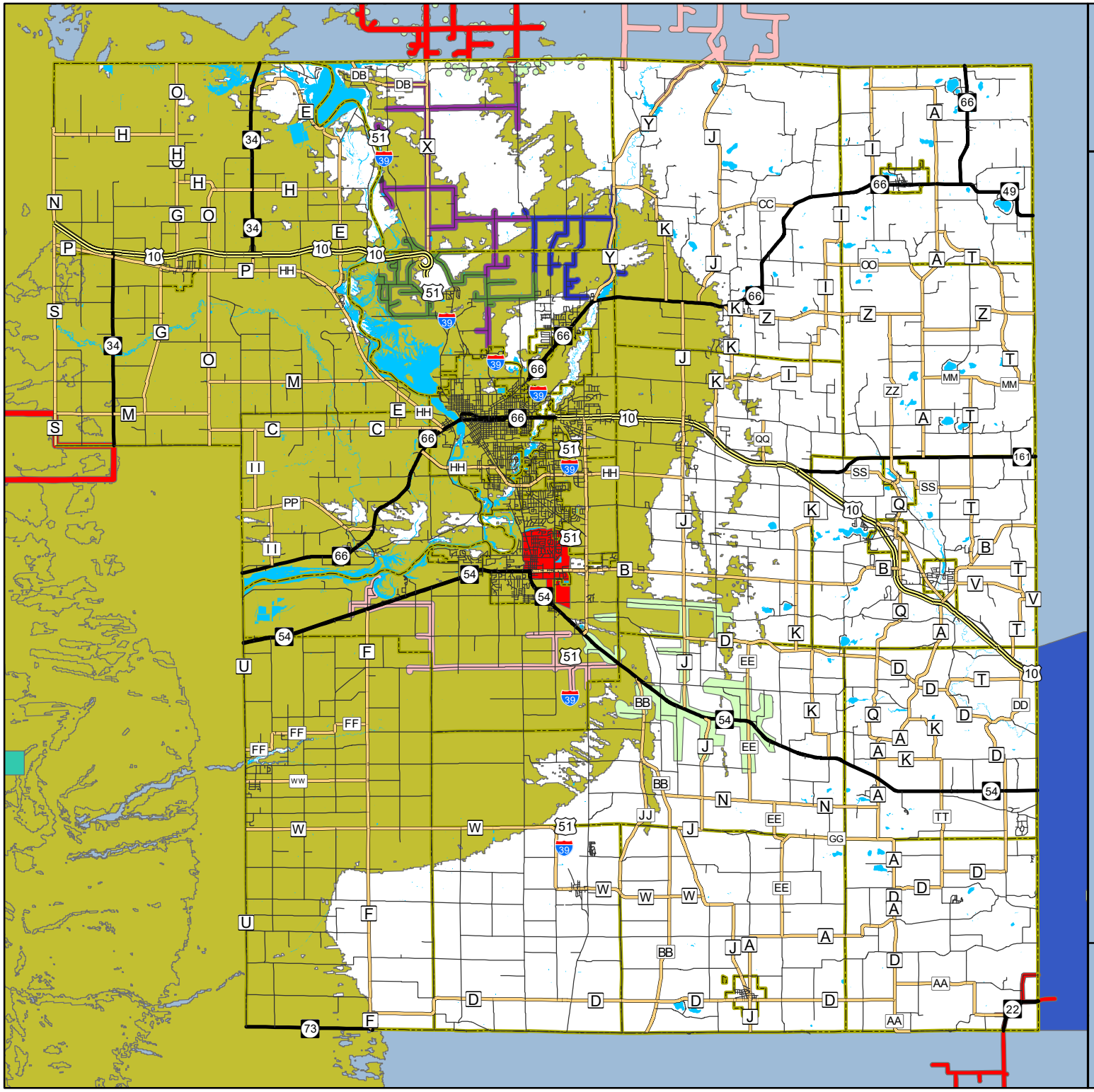


Map 4b **DRAFT**

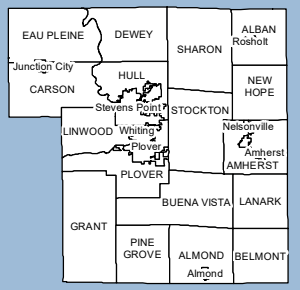
Existing Grant Areas

Portage County, Wisconsin

- Minor Civil Divisions
- U.S. Highway
- State Highway
- County Highway
- Local Road
- Water

Grant Round

- No Year Noted
- 2014
- 2015
- 2017
- 2018, Round 1
- 2018, Round 2
- 2019
- 2020
- 2021
- 2022 ARPA



Source: WI DNR, NCWRPC, Portage Co, WisDOT, FCC, PSC

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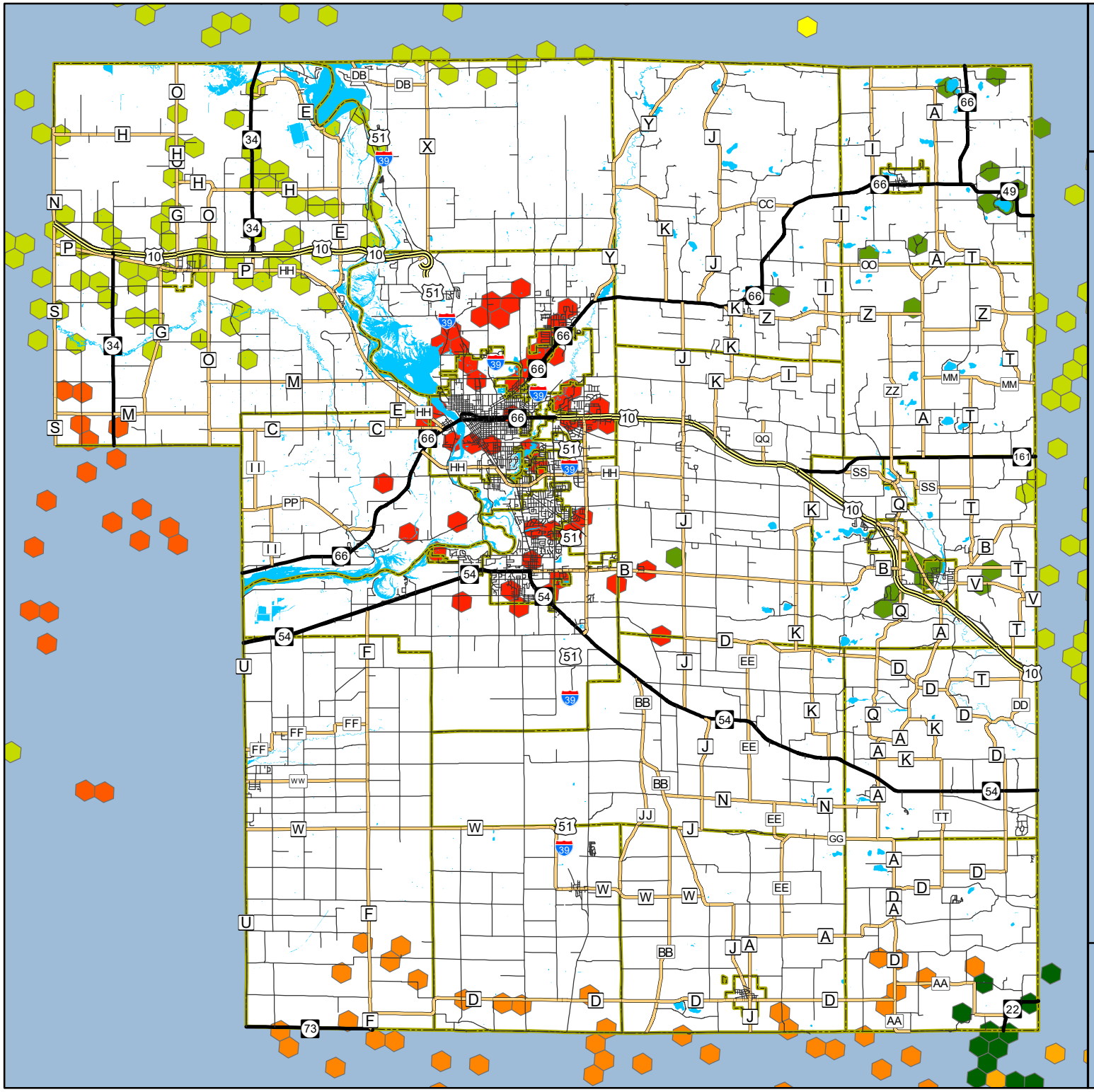


Map 5a **DRAFT**

Broadband Availability Copper

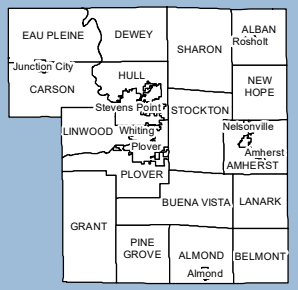
Portage County, Wisconsin

- Minor Civil Divisions
- U.S. Highway
- State Highway
- County Highway
- Local Road
- Water

Copper

Provider

- AT&T Inc
- Amherst Telephone Company
- Brightspeed
- CenturyLink
- Frontier
- Solarus
- TDS Telecom
- Union Telephone Company
- Wittenberg_Telephone_Company



Source: WI DNR, NCWRPC, Lincoln Co, WisDOT, FCC

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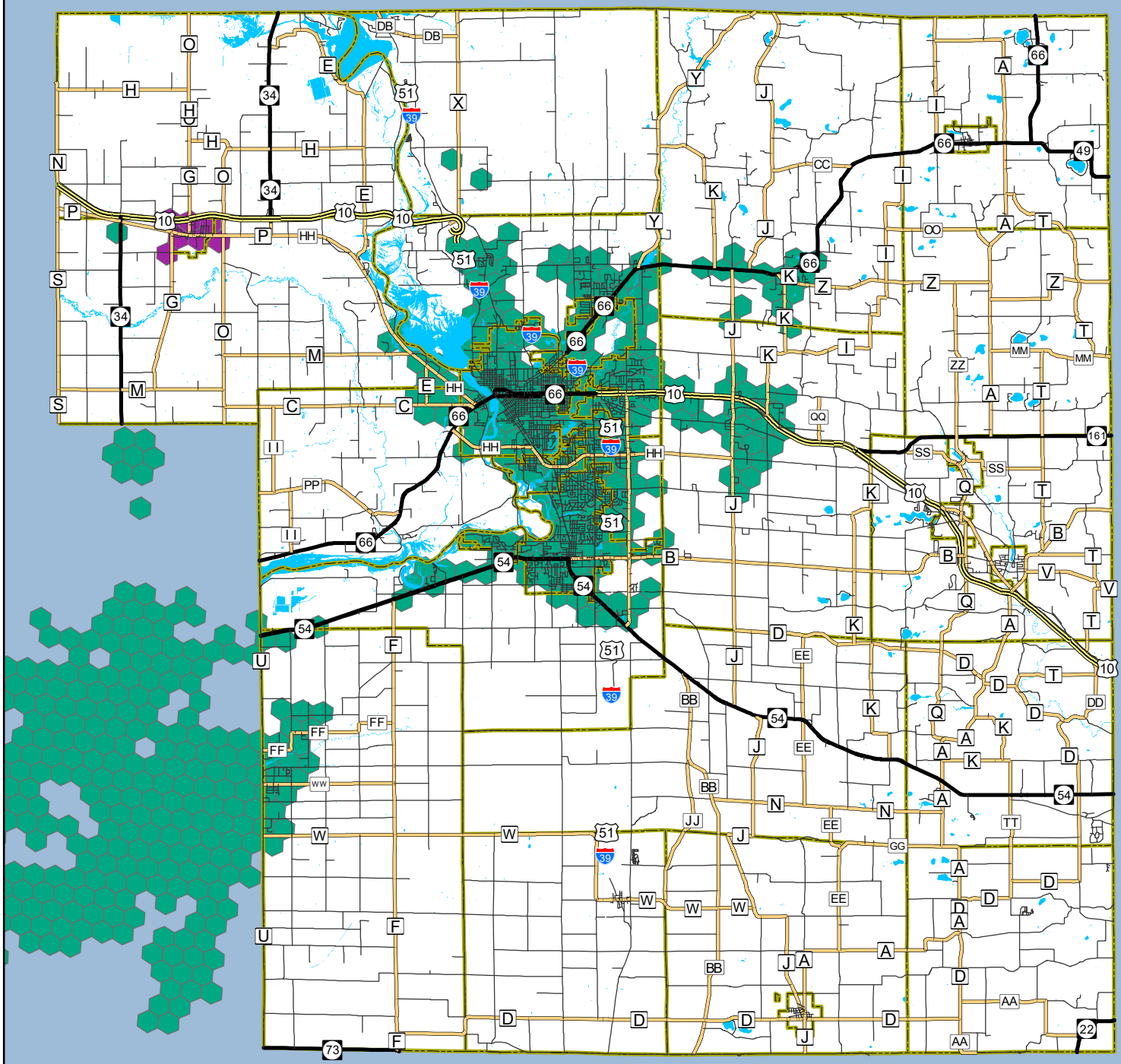
Map 5b **DRAFT**

Broadband Availablity Cable

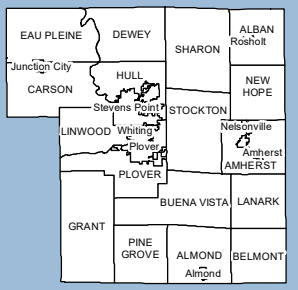
Portage County, Wisconsin



- Minor Civil Divisions
- U.S. Highway
- State Highway
- County Highway
- Local Road
- Water

Cable Provider

- Astrea
- Charter Communications Inc



Source: WI DNR, NCWRPC, Portage Co, WisDOT, FCC

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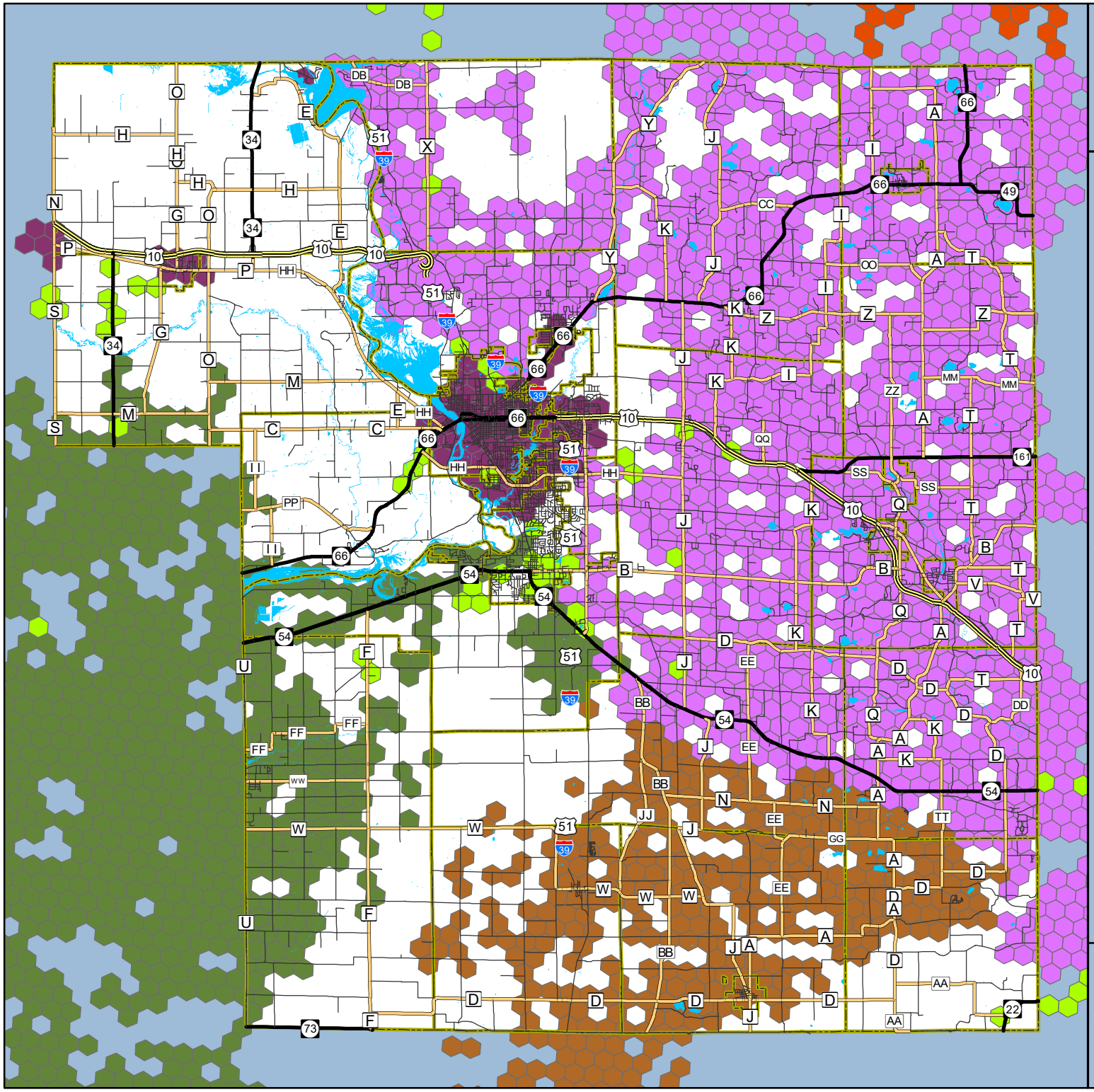


Map 5c **DRAFT**

Broadband Availability Fiber

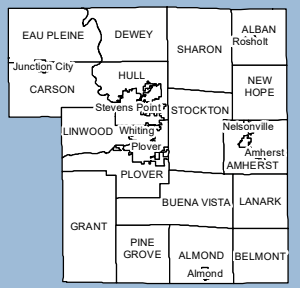
Portage County, Wisconsin

- Minor Civil Divisions
- U.S. Highway
- State Highway
- County Highway
- Local Road
- Water

Fiber

Provider

- Amherst Telephone Company
- Charter Communications Inc
- Solarus
- TDS Telecom
- Union Telephone Company
- Wittenberg_Telephone_Company



Source: WI DNR, NCWRPC, Portage Co, WisDOT, FCC

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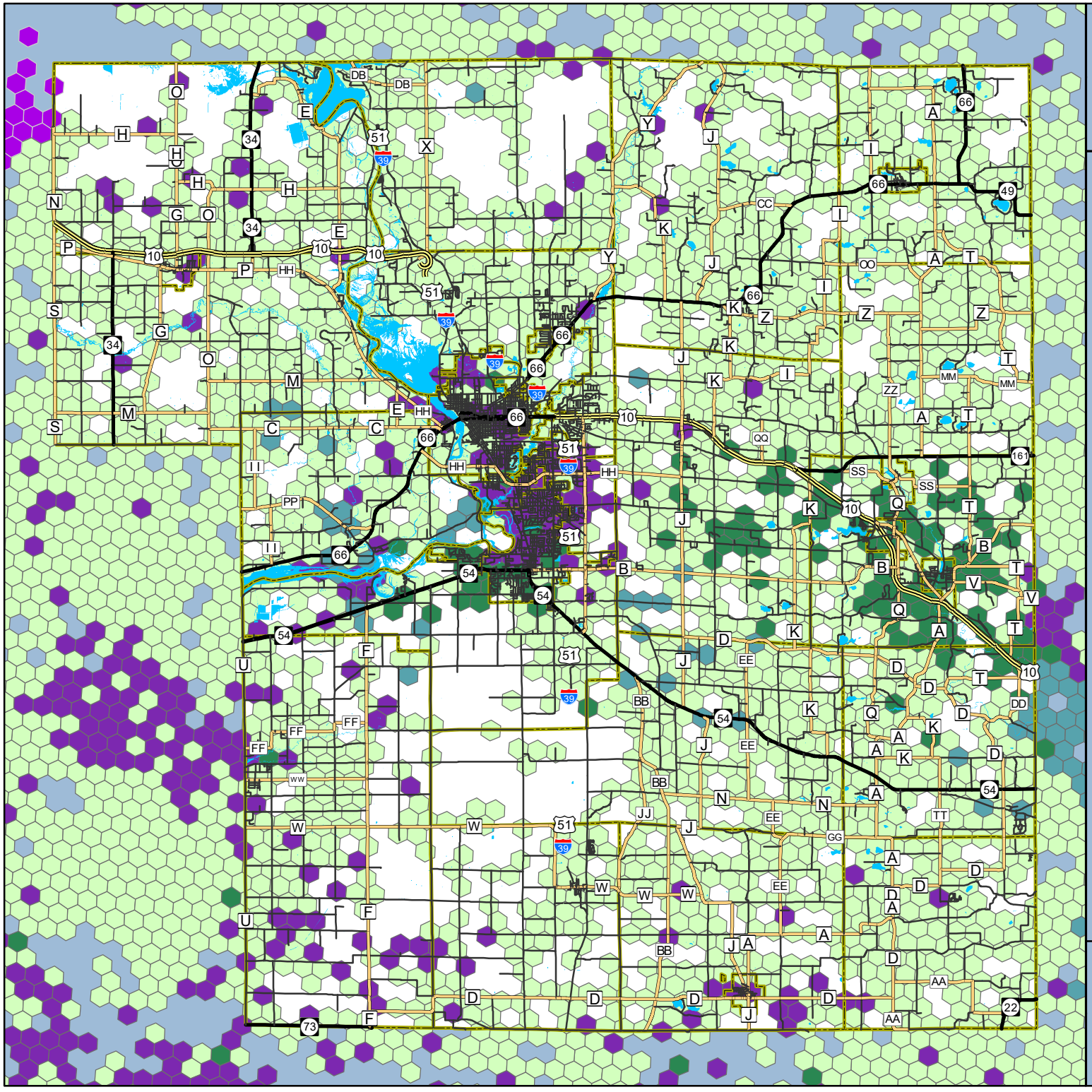


Map 5d **DRAFT**

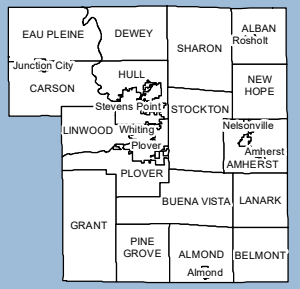
Broadband Availability Fixed Wireless

Portage County, Wisconsin

- Minor Civil Divisions
- U.S. Highway
- State Highway
- County Highway
- Local Road
- Water

Provider

- AT&T Inc
- Bug Tussel Wireless LLC
- Country Wireless
- T-Mobile US
- US Cellular



Source: WI DNR, NCWRPC, Portage Co, WisDOT, FCC

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210 McClellan St., Suite 210, Wausau, WI 54403
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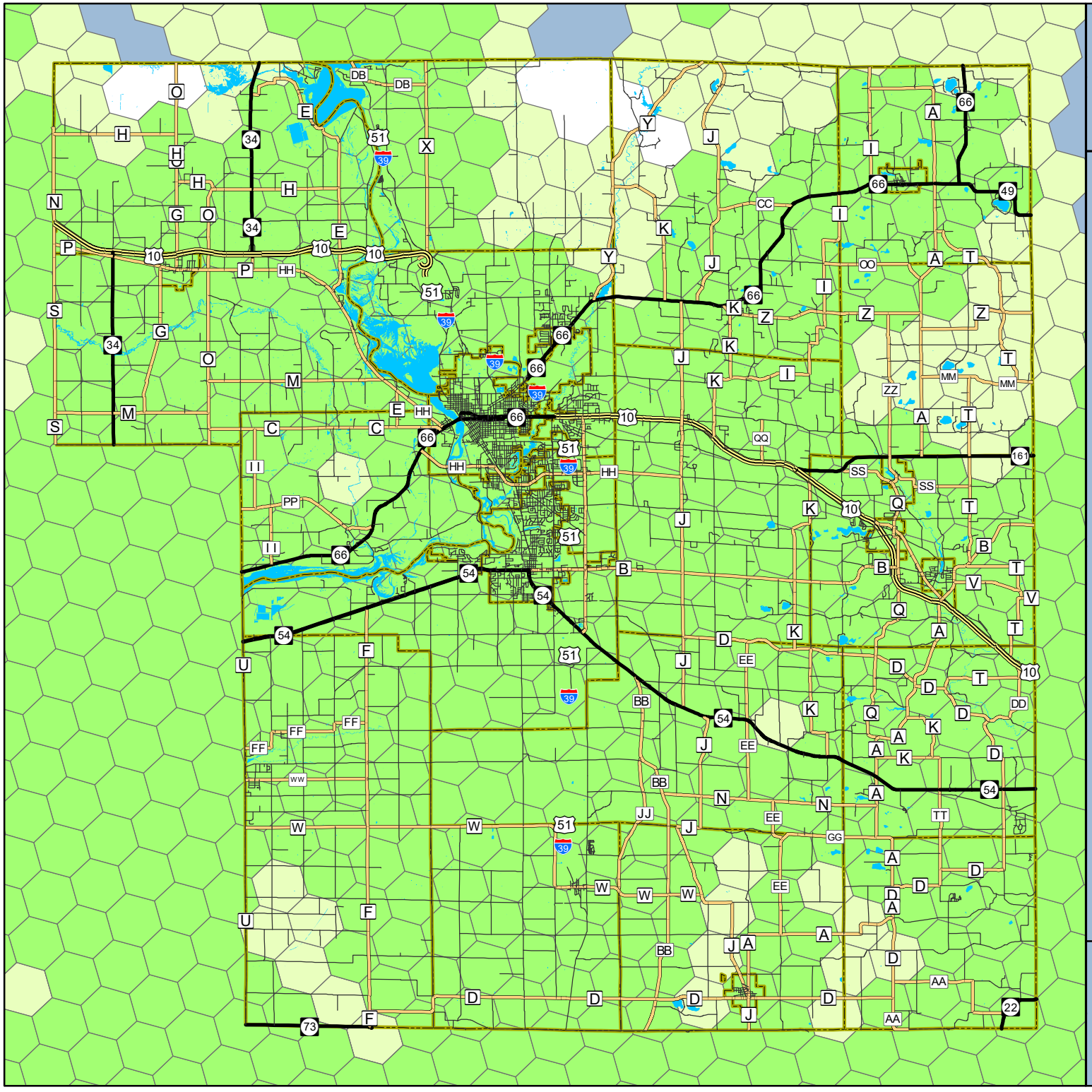
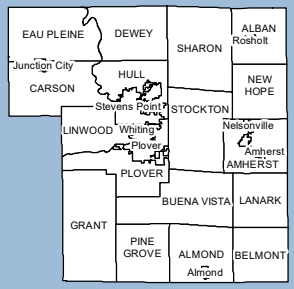
Map 5e **DRAFT**

Broadband Availability Mobile

Portage County, Wisconsin



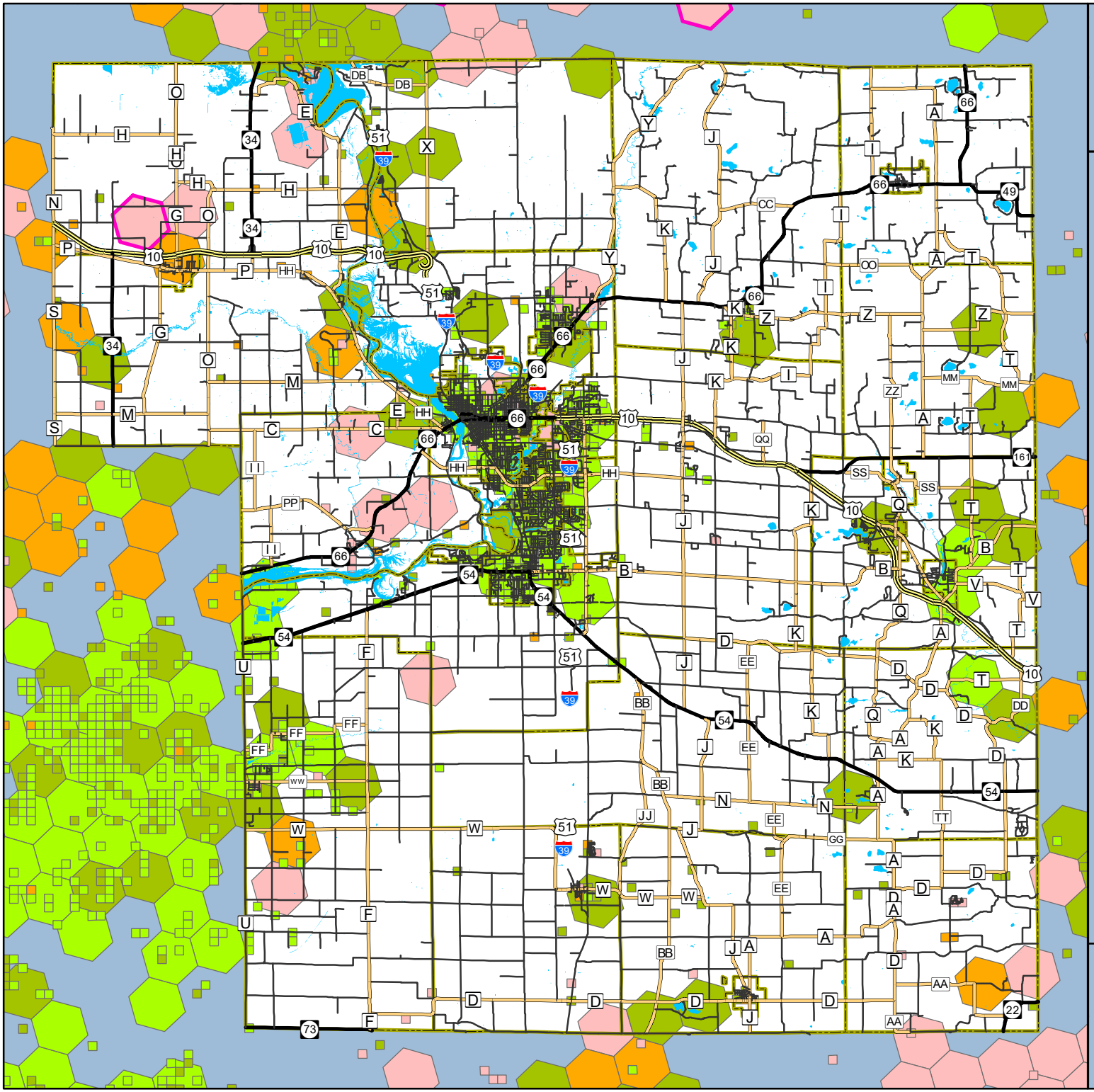
- Minor Civil Divisions
- U.S. Highway
- State Highway
- County Highway
- Local Road
- Water
- 5G Coverage
- 4G Coverage



Source: WI DNR, NCWRPC, Portage Co, WisDOT, FCC

This map is neither a legally recorded map nor a survey and is not intended to be used as one. This drawing is a compilation of records, information and data used for reference purposes only. NCWRPC is not responsible for any inaccuracies herein contained.

Prepared By:
North Central Wisconsin Regional Planning Commission
210 McClellan St., Suite 210, Wausau, WI 54403
715-849-5510 - staff@ncwrpc.org - www.ncwrpc.org



Map 6 **DRAFT**

Average Download Speeds

Portage County, Wisconsin

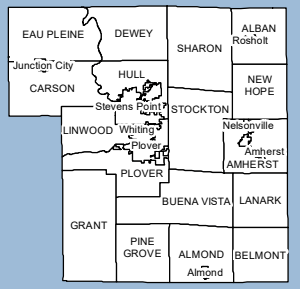
- Minor Civil Divisions
- U.S. Highway
- State Highway
- County Highway
- Local Road
- Water

Download Speed

- < 10 Mbps
- 10 to 25 Mbps
- 25 to 100 Mbps
- > 100 Mbps
- Reported No Service

From wisconsinspeedtest.net - August 8, 2023
No service reported - Cost and or can not find a provider.

Small square test locations from Ookla speed test
Fixed wired only October 2022 - Open Data



Source: WI DNR, NCWRPC, Portage Co, WisDOT, FCC

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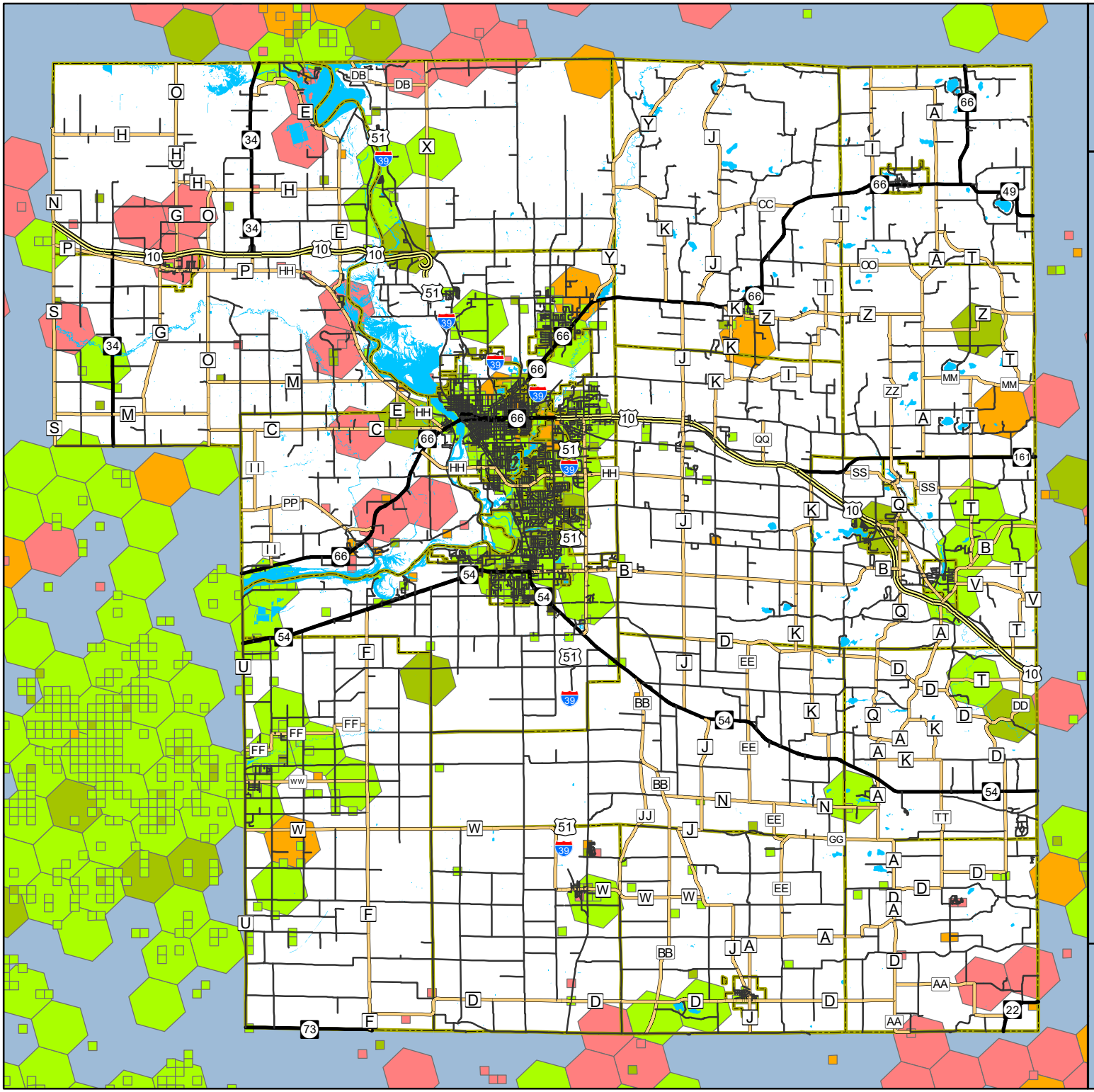


Map 7 **DRAFT**

Average Download Speeds

Portage County, Wisconsin

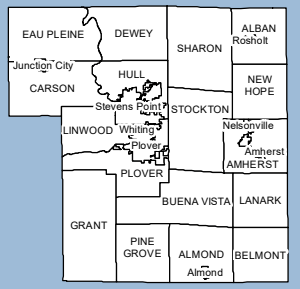
- Minor Civil Divisions
- U.S. Highway
- State Highway
- County Highway
- Local Road
- Water

Upload Speed

- < 2 Mbbs
- 2 to 5 Mbbs
- 5 to 10 Mbps
- > 10 Mbps

From wisconsinspeedtest.net - August 8, 2023
No service reported - Cost and or can not find a provider.

Small square test locations from Ookla speed test
Fixed wired only October 2022 - Open Data



Source: WI DNR, NCWRPC, Portage Co, WisDOT, FCC

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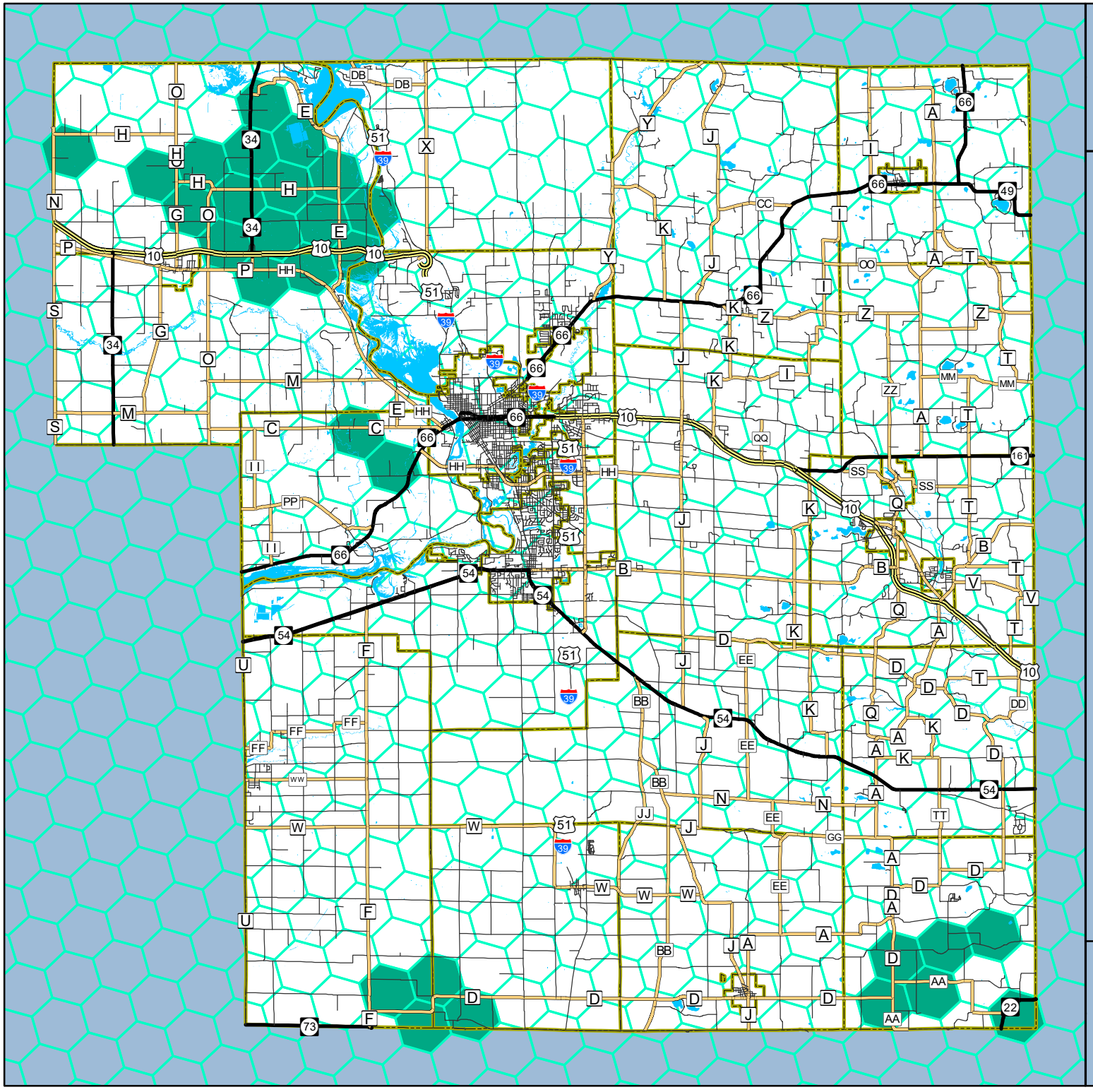
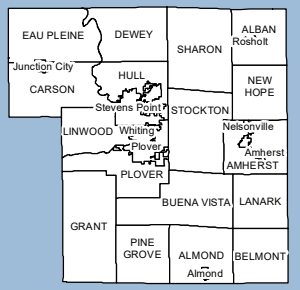
Map 8 **DRAFT**

Possible Project Areas

Portage County, Wisconsin



- Minor Civil Divisions
- U.S. Highway
- State Highway
- County Highway
- Local Road
- Water
- Possible Project Areas



Source: WI DNR, NCWRPC, Portage Co, WisDOT, FCC

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715-849-5510 - staff@ncwrpc.org - www.ncwrpc.org

C. PSC COUNTY SUMMARY

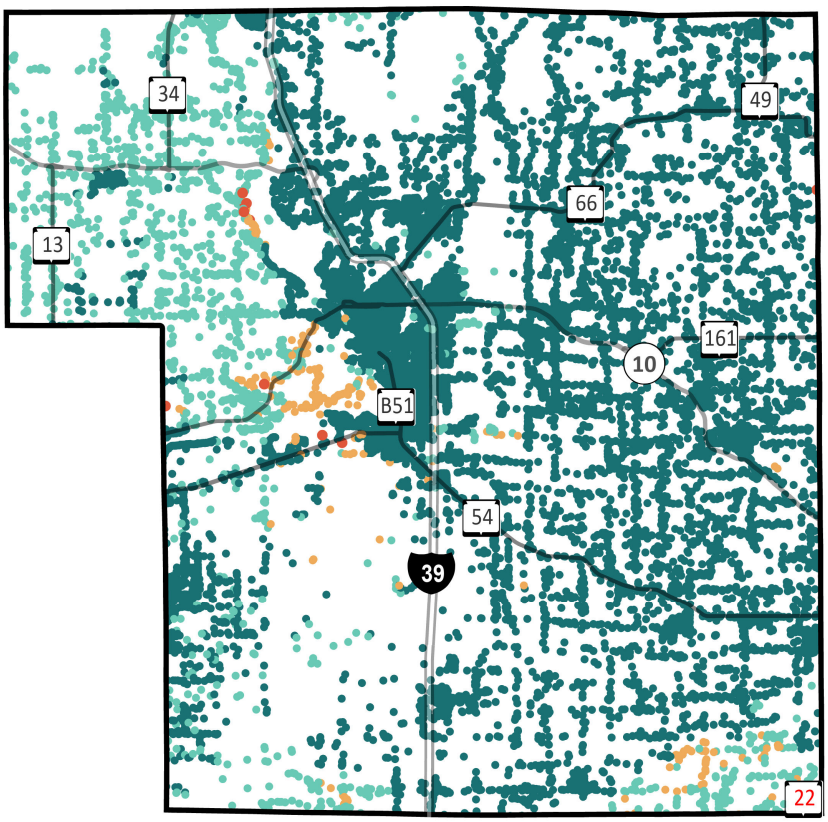
Wisconsin Broadband Access- Serviceable Locations (BSL)

Portage County

Total BSLs **28,426**

Underserved, Unserved and No Service Count **2,106**

Source: FCC Broadband Data Collection BSL Service Status as of June 30, 2023



Explore the Broadband Planning Map at https://maps.psc.wi.gov/apps/WisconsinBroadbandPlanningMap/

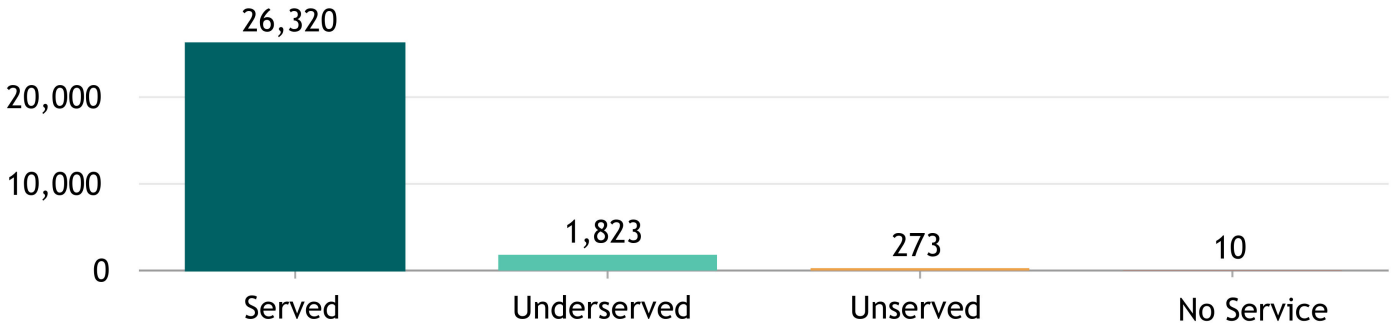
Served >= 100/20 (Mbps)

Underserved >25/3 and <100/20 (Mbps)

Unserved <25/3 (Mbps)

No Service

BSL count, by service status



"Broadband service' = an internet service with a minimum speed 100/20 Mbps

% of BSLs, by urbanicity type, by service status

Note: For counties having 100% BSL in the same urbanicity type only one bar is displayed.

Wisconsin Broadband Office

PSC of WISCONSIN

Wisconsin Broadband- Enforceable Funding Commitment

Portage County

28,426

Count of Total BSLs

2,106

Count of Underserved, Unserved, and No Service BSLs

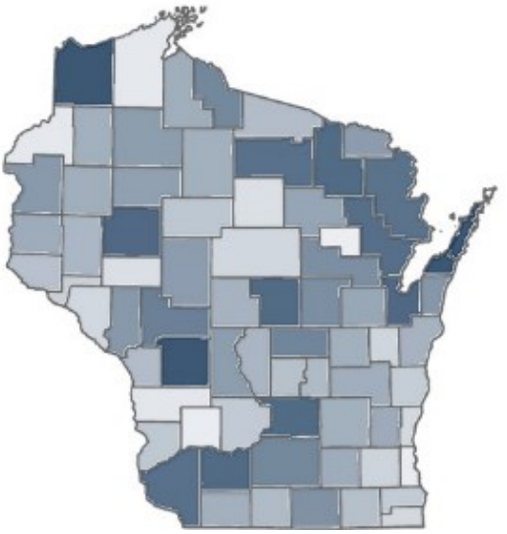
Source: FCC Broadband Data Collection BSL Service Status as of June 30, 2023

"Enforceable Funding Commitment", (EFC) for the purposes of BEAD is any "in progress" award that will build service of at least 100/20 to all locations by either a wireline cable or fiber connection, or a licensed fixed wireless connection. This includes a subset of state awards, all ARPA awards, all USDA Reconnect awards, RDOF, and E-ACAM.

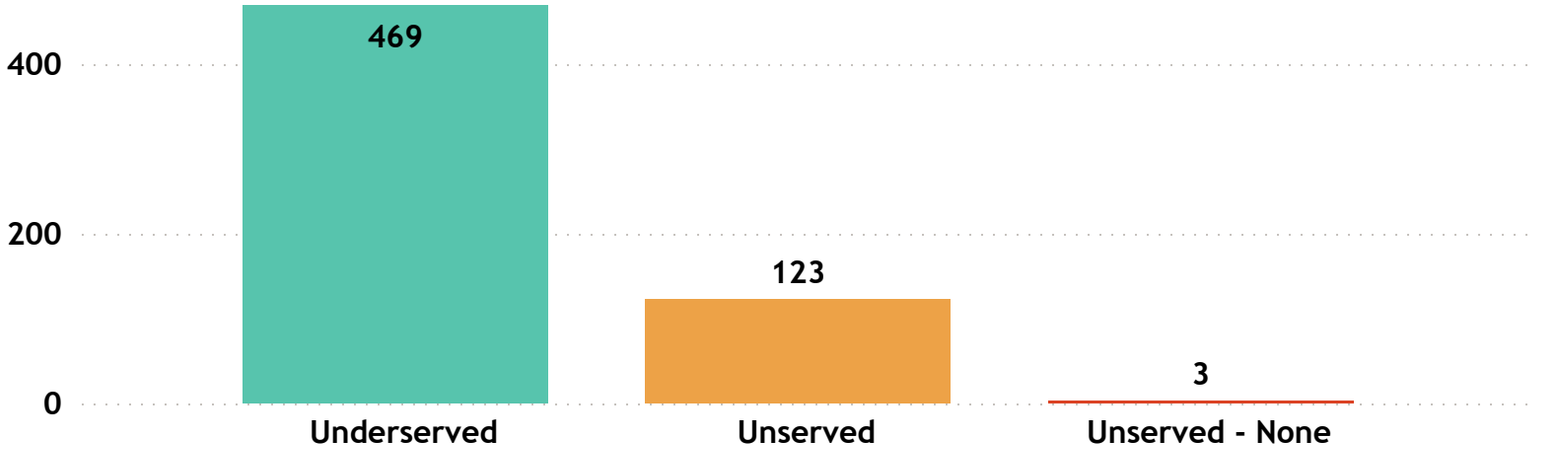
Estimated Underserved, Unserved and No Service Locations without Enforceable Funding Commitment

595

Estimated Underserved, Unserved and No Service Locations without EFC (count of locations min to max)



Estimated Underserved, Unserved, and No Service locations without EFC



Wisconsin Broadband Office

PSC of WISCONSIN

Wisconsin Broadband- Internet Service Providers

Portage County

FCC service as of December 31, 2022

18

ISP
AirNet
Amherst Telephone Company
Astrea
AT&T Inc
Brightspeed
Bug Tussel Wireless LLC
CenturyLink (owned by Lumen)
Charter Communications Inc
Consolidated Communications, Fidium
Country Wireless
Fusion
Solarus
TDS Telecom
T-Mobile US
Union Telephone Company
United States Cellular Corporation
Verizon
Waupaca Online

Wisconsin Broadband Affordability- Plan Cost

'Broadband service' = an internet service with a minimum speed 100/20 Mbps

ISPs in Wisconsin: **126**

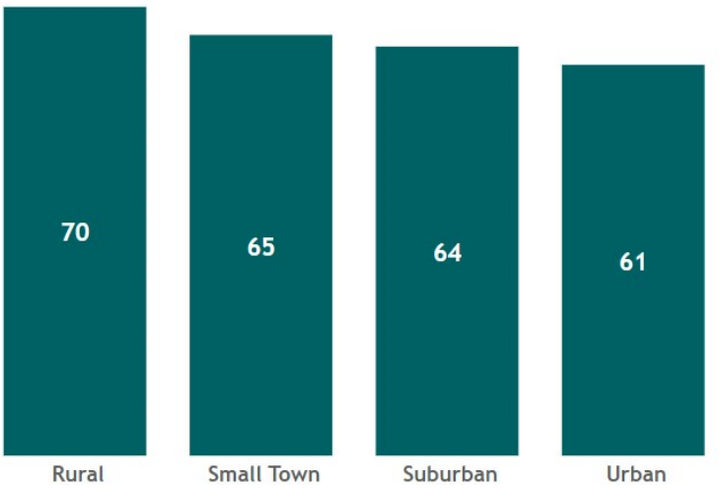
ISPs in Portage County: **18**

State Minimum Broadband Monthly Price Range
$ 49.95 - $ 156.50

State Average of Minimum Broadband Price/ Month
$64.85

WI Household (HH) Median Income
$67,080

WI Average Minimum Broadband Price/ Month (in $) by Urbanicity



Source: Service offerings from ISPs representing 2,200 price offerings across all counties.

AFFORDABILITY CRITERIA:
1.17% of Household Income

HH annual income-range ($)	Broadband Plan* monthly cost
less than $15K	less than $15
$15K - $24K	$15 - $24
$25K - $39K	$25 - $38
$40K - $54K	$39 - $52
$55K - $69K	$53 - $67
$70K - $84K	$68 - $81
$85K - $99K	$82 - $96
$100K - $150K	$97 - $146
$150K+	$147+

* Broadband plan: is a plan providing internet service of a minimum speed of 100/20Mbps
The commonly accepted Broadband cost-burden threshold's income (see worldwide affordability target by 2025)

Portage County

Average of Minimum Broadband Price/ Month

$ 67.31

Portage County

Household (HH) Median Income

$ 60,316

Wisconsin HHs: 2,401,818

Portage County HHs: 28,912

Source: ACS 5y 2017-2021

Wisconsin Broadband Office

PSC of WISCONSIN

D. INTERNET SERVICE PROVIDERS

REGIONAL INTERNET SERVICE PROVIDERS

*** Indicates known Internet Service Provider in Portage County**

Provider	Website	Phone	Mailing Address
Airnet*	netpros-inc.net	715-241-0200	117 S. 17th Avenue Suite B Wausau, WI 54401
AirRunner Networks	www.airrun.net	715.443.3700	216 Main St #3, Marathon City, WI 54448
Amherst Telephone Company*	amherstcomm.net	715.842.5529	120 Mill St, Amherst, WI 54406
Astrea*	astreaconnect.com	800.236.8434	105 Kent St, Iron Mountain, MI 49801
AT&T*	www.att.com	210.821.4105	208 S. Akard Street, Suite 2954, Dallas, Texas 75202.
Bertram Internet	gobertram.com	920.351.1023	300 Industrial Dr, Random Lake, WI 53075
Brightspeed*	www.brightspeed.com	833.692.7773	1120 S Tryon St, Charlotte, NC 28203
Bug Tussel Wireless LLC*	btussel.com	877.227.0924	417 Pine St, Green Bay, WI 54301
Cellcom*	www.cellcom.com	920-339-4000	1580 Mid Valley Drive, De Pere, WI 54115
CenturyLink*	www.centurylink.com	877.862.9343	100 CenturyLink Dr. Monroe, LA 71203
Charter Communications Inc (Spectrum)*	www.spectrum.com	855.860.9068	5720 Bandel Rd NW, Rochester, MN 55901
Cirrinity (Wittenberg Telephone Company)	cirrinity.net	715.253.2111	104 W Walker St, Wittenberg, WI 54499
Consolidated Communications*	consolidated.com		
Community Antenna System Inc	comantenna.com	888.394.4772	1010 Lake Street Hillsboro, WI 54634
Country Wireless*	countrywireless.com	715.389.8584	205 W Willow Dr, Spencer, WI 54479
Ethoplex	www.ethoplex.com	262-252-9000	N115 W19150 Edison Drive, Germantown, WI 53022

Frontier	frontier.com	844.817.0206	401 Merritt 7, Norwalk, CT 06851
HughesNet*	www.hughesnet.com	844.7.37.2400	11717 Exploration Lane, Germantown, MD 20876
LTD Broadband	ltdbroadband.com	507.369.6669	PO Box 3064, Blooming Prairie, MN 55917
Lumen	www.lumen.com	877.753.8353	3340 Peachtree Road NE Suite 200 Atlanta, GA 30326
Marquette-Adams Telephone Cooperative	www.marquetteadams.com	608-586-4111	113 N, 113 S Oxford St, Oxford, WI 53952
Mediacom Wisconsin LLC	mediacomcable.com	844.987.3260	100 N Marquette Rd Suite 116, Prairie du Chien, WI 53821
Norvado	norvado.com	800.250.8927	105 N Avon Ave, Phillips, WI 54555
Nsight	www.nsighttel.com	920.865.7000	122 S St Augustine St, Pulaski, WI 54162
Reach	reachconnects.com	715.298.4414	1710 Garfield Ave, Wausau, WI 54401
Solarus*	www.solarus.net	715.421.8111	440 E Grand Ave, Wisconsin Rapids, WI 54494
SonicNet Inc.	www.sonicnet.us	715.301.0600	103 N Railroad St, Eagle River, WI 54521
Starlink	www.starlink.com	888.479.9644	500 Center Ridge Dr Austin, TX 78753
TDS Telecom*	tdstelecom.com	855.220.2592	525 Junction Road Madison, WI 53717
T-Mobile US*	www.t-mobile.com	844.249.6310	12920 Se 38th St., Bellevue, WA, 98006
Union Telephone Company*	uniontel.net	715.335.6301	W North St, Plainfield, WI 54966
US Cellular Corporation*	www.uscellular.com	800.819.9373	8410 W Bryn Mawr Ave, Chicago, IL 60631
Verizon*	www.verizon.com	800.922.0204	One Verizon Way, Basking Ridge, New Jersey 07920
Viasat*	www.viasat.com	844.702.3199	6155 El Camino Real Carlsbad, CA 92009
Waupaca Online	cityofwaupaca.org/waupacaonline/	715.942.9919	111 South Main Street Waupaca, WI 54981

E. ADDITIONAL RESOURCES

ADDITIONAL PROGRAM DETAILS AND RESOURCES

Helpful Websites:

Broadband USA Program. The National Telecommunications and Information Administration's (NTIA) programs and policymaking focus largely on expanding broadband Internet access and adoption in America, expanding the use of spectrum by all users, and ensuring that the Internet remains an engine for continued innovation and economic growth. NTIA will implement a number of broadband programs including the BEAD program. The website is very helpful for staying informed about the most recent developments and updates concerning broadband programs.

https://broadbandusa.ntia.doc.gov/

Community Economic Development-UW Extension. The UW-Extension works to support communities by providing resources and training opportunities to increase broadband access.

https://economicdevelopment.extension.wisc.edu/topics/broadband/

Wisconsin Public Service Commission. The Wisconsin Broadband Office, part of the Public Service Commission, leads statewide efforts to expand broadband access, adoption, and affordability. WBO provides support to residents seeking internet access, manages broadband grant programs, compiles broadband service maps, and builds capacity through planning and outreach.

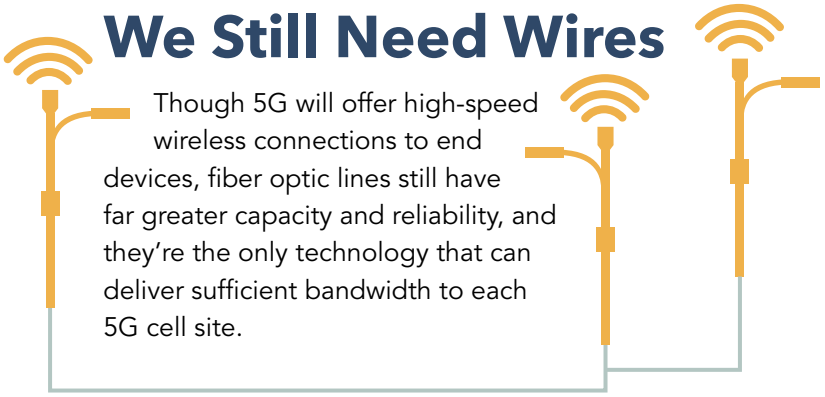
https://psc.wi.gov/Pages/ServiceType/Broadband.aspx

A Pocket Guide To 5G HYPE

5G, or "fifth generation" wireless, is a set of new standards and technological improvements that will enable faster wireless connectivity once implemented.

Compared to current 4G LTE networks, in which users connect to towers thousands of feet away, typical 5G networks require much more densely deployed infrastructure, with small cell base stations less than 1,000 feet from devices. The cell sites will be connected to each other and the broader Internet by fiber optic cables. 5G networks are being marketed both for mobile (e.g., cell phones) and fixed (e.g., home Internet access) uses and as smart city infrastructure.

We Still Need Wires



Though 5G will offer high-speed wireless connections to end devices, fiber optic lines still have far greater capacity and reliability, and they're the only technology that can deliver sufficient bandwidth to each 5G cell site.

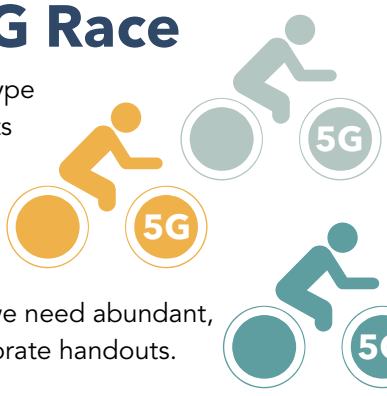
5G Won't Fix the Broadband Market

Competition is limited by economic considerations, not technology. 5G providers are unlikely to rival cable directly because big companies prefer to divide markets rather than engage in robust competition. 5G development won't open the market to new competition because only the biggest telephone companies, like AT&T and Verizon, have access to the volume of spectrum needed.

5G Won't Solve the Digital Divide

Since 5G connectivity relies on fiber optics that aren't available in many rural areas, these communities won't receive 5G access anytime soon. The same market reality discouraging investment in rural broadband will also discourage 5G investment. Even in urban areas, companies like AT&T and Verizon are unlikely to start investing in the low-income neighborhoods they have neglected for years.

There's No 5G Race



The "5G Race" is marketing hype designed to scare governments into giving companies large subsidies and consumers into paying a premium for prototype devices. To achieve widespread 5G deployment, we need abundant, open fiber networks, not corporate handouts.

This fact sheet is a response to the hype around 5G in the United States, primarily from the big wireless companies.

Community Networks

ILSR Institute for Local Self-Reliance

MuniNetworks.org | ILSR.org
Published August 2019

5G and Fiber-to-the-Home (FTTH) are complementary technologies that are each best suited to different applications.

	RELIABILITY	SPEED	AFFORDABILITY	BEST USES
5G	Requires line-of-sight. Trees, buildings, and sometimes weather can impact reliability.	Eventually more than 1 gigabit to devices in ideal conditions, but often slower based on environmental factors and congestion.	Mobile plans often have restrictive data caps with overage fees and throttling.	Well suited for mobile uses, like cell phones and smart transportation, in densely populated areas.
FTTH	Very reliable connectivity not impacted by environmental conditions.	No known limits on speed with providers commonly offering 1 gigabit or even 10 gigabits.	Varies by the provider with locally-based networks offering the best prices.	Ideal option for fixed Internet access at a home or business in both urban and rural areas, using Wi-Fi to connect most devices.

FCC Small Cell Order Hurts Local Control

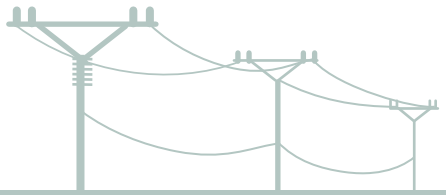
In late 2018, the Federal Communications Commission (FCC) adopted an Order that limits how municipalities and local governments can negotiate with carriers over 5G small cell deployments. By preempting local authority, the FCC has undermined the ability of communities to promote digital equity, to the benefit of national telecom companies.

Don't Fall for Big Telecom's 5G Hype

Wireless technologies like 5G are complementary to robust, wired networks. On their own, 5G networks will not achieve key goals, such as connecting rural America and closing the digital divide.

Additional Resources

- The Wireless Industry's 5G Hype is Funny and Overblown from New America
- Moving Toward 5G: What Cities Need to Know from Next Century Cities
- Guide to FCC Small Cell Order from Next Century Cities
- FCC Stomps on Local Control in Latest Small Cell Order from the Institute for Local Self-Reliance
- Dive Deep Into 5G with Mobile Expert Sascha Segan from Community Broadband Bits Podcast
- Straight Talk About 5G from Community Broadband Bits Podcast
- Will 5G end up leaving some people behind? from NBC News



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Published August 2019

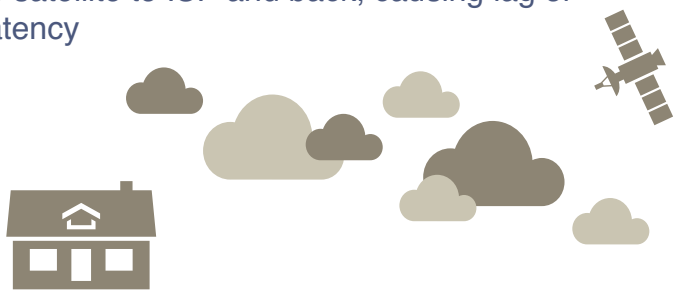
Satellite Is Not Broadband

In 1996, Congress recognized the need for both urban and rural communities to have high-speed Internet service and passed the Telecommunications Act to encourage deployment across the entire U.S. New technologies have helped bring high-quality connectivity to more people than ever before, but many rural Americans still don't have access to broadband.

High-quality connectivity needs to be fast, affordable, and reliable. Satellite is none of the three.

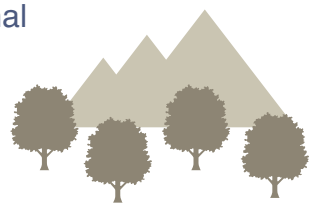
High Latency

- Signal travels long distance from home to satellite to ISP and back, causing lag or latency



Unreliable Connections

- Natural phenomenon, such as trees, hills, and clouds can interfere with signal
- Erratic performance and dropped connections are common

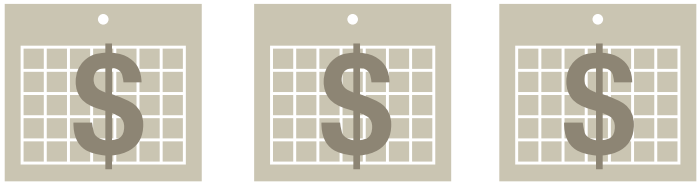


Slow Speeds

- Subscribers rarely reach minimum federal standards for broadband, regardless of advertising claims
- Maximum speeds require optimal conditions

Bad Service Plans

- Often require long-term commitments
- Service costs may increase after subscribers sign a contract
- Data Caps drive up the cost and interfere with subscribers' service until next billing cycle



"If it rains, or if it snows, or if they need to [listen to] a podcast or they want to watch anything educational, do research, listen to teachers online, they cannot do so because the connection ping time is so bad and on top of that, it uses too much of our plan…. Our kids can't do their homework at home."

— Gerald Pine, Retired USAF; Eureka Springs, AR
Comment to the FCC

Banner County, Nebraska.
Public Domain Image from Wikimedia Commons

Community Networks

ILSR Institute for Local Self-Reliance

September 2018

Rural areas need Internet access on par with urban areas.

Education

K-12 education in both rural and urban areas relies heavily on online resources. If satellite Internet service can handle the required upload capacity, uploading homework often uses up allocated data, driving up the cost of a family's plan. Rural kids who must rely on satellite Internet service are steps behind their urban peers.

Distance learning is a necessity when colleges and technical training programs are too far away from home. Satellite Internet access prevents rural residents from improving their economic opportunities through education.

Healthcare for Seniors and Veterans

Slow upload speeds prevent rural Americans from using telehealth applications if they depend on satellite Internet access.

Economic Development

Rural industries such as agriculture and food processing increasingly rely on high-speed Internet access for daily operations, including real-time commodity price reporting and Just-in-Time inventory management. Other companies seek out rural and exurban areas with fiber connectivity for large data centers and distribution centers. Satellite Internet does not have the capacity to meet the needs of these businesses.

Peaceful rural areas can also attract families, enhancing the tax base and strengthening the community. People can establish home-based businesses or work remotely, but satellite Internet access limits the ability to do so.

Calling Satellite Internet "Broadband" Means Leaving Rural Communities Behind

The fact that we can access the Internet using satellites is a triumph of technology. But it is better suited to truly remote locations, like in largely unsettled areas of Alaska and northern Canada. Satellite is not a long term solution for the vast majority of rural America that already has a wire running to the home for electricity. It may be useful while rural communities are waiting to be connected with better options, but embracing satellite as a long term solution condemns those regions to rapidly declining property values and few opportunities for economic development.

Franklin, Nebraska.
Public Domain Image from Wikimedia Commons

Community Networks

ILSR Institute for Local Self-Reliance

Broadband 101

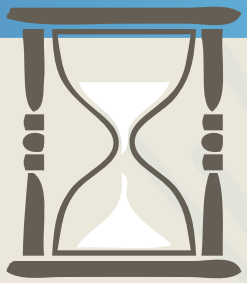
A handy guide to the **basics of broadband terminology** and **technology for policymakers and concerned citizens.**

ILSR
INSTITUTE FOR Local Self-Reliance

Basic Terminology

- **Bits** are the base unit of information in computing. Network speeds are usually measured in "bits per second"
  - 1 **Kilobit** (Kbps) = 1,000 bits transferred per second (bps) Dial-up connections are 56 Kbps
  - 1 **Megabit** (Mbps) = 1,000,000 bps; about 30 seconds to download an MP3 song
  - 1 **Gigabit** (Gbps) = 1,000,000,000 bps; about 10 seconds to download an HD movie
- **Bytes** are the base unit for file size and used in computing monthly caps
- FCC Definition of "**broadband**" is minimum speeds of 25 Mbps downstream and 3 Mbps upstream; many uses of connectivity require faster speeds than the minimum of 25/3
- **"Download"** is the speed, measured in bits, that your computer receives data
- **"Upload"** is the speed that your computer sends data
- **"Symmetric"** connections are comparable in upload and download speeds. DSL and cable often has upload speeds 5-10x slower than downstream. Businesses increasingly need symmetric connections to maximize productivity

Traditional Technology



- **DSL** uses the copper telephone lines to deliver access to the Internet. Common DSL downstream speeds are .5 to 6 Mbps, though they can get up to 40 for people living very close to the equipment that generates the signal. Upstream speeds are often below 1.5 Mbps and rarely exceed 4.
- **Cable,** fittingly enough, uses a cable network to deliver services. Speeds commonly vary from 6-30 Mbps download and 1-3 Mbps upload on standard tiers. Some cable companies offer 100 Mbps down and 10 Mbps up for a hefty premium. However, **cable networks are shared**, meaning you may not achieve the advertised speeds during periods of peak usage due to congestion from your neighbors.
- **Wireless** Internet access is a complement to wired connections, not a substitute. Many 4G networks have **caps that strictly limit usage**. For more on wireless, see our Wireless Fact Sheet.

http://muninetworks.org/content/wireless-internet-access-fact-sheet

Common Broadband Goals

- Faster speeds now
- Affordable service
- Reliable performance
- Universal access
- Scalable Networks (often fiber-optic) that allow capacity to grow as a rapidly as demand

Fiber Optics

- The Gold Standard.
- Basic idea: Lasers shoot pulses of light across very thin strands of glass.
- Fiber optic networks are **reliable**, **resilient**, and use technology that offers nearly **unlimited** expansion. They have fewer points of failure than copper and cable networks.
- Fiber strands last for **decades** and capacity can be increased by upgrading the lasers on each end without having to lay new fiber.
- The high cost of new fiber networks is mostly the labor to put the cables in place on poles or in conduit underground; operating costs are lower than for cable, DSL, or wireless networks.

Cable and DSL Are Inadequate

- 21st Century businesses require faster connections – "basic broadband" is not sufficient
- DSL/Cable technology is unreliable: Interrupted Service = Lost Revenue
- Cable and DSL advertise "up to" speeds – actually reaching those speeds is rare

"All the Internet-connected, data-hungry gadgets that are coming to market sent a strikingly clear message: we're going to need faster broadband networks."

FCC Chairman Genochowski, 2013

COMPETITION

- In many industries, market competition ensures good outcomes. Unfortunately, cable and Internet networks are, and will remain, largely uncompetitive.
- Most of us have two options at home for Internet access. DSL is the slow, less expensive option and cable a more expensive, faster option.
- Wired telecommunications networks are a **natural monopoly** - they have very high upfront capital costs and declining marginal costs. This makes **robust competition all but impossible**... and Wall Street knows it.

"We're big fans of [Comcast's] Video and High-Speed Internet businesses because both are either monopolies or duopolies in their respective markets."

SeekingAlpha.com, 2012

Learn More – Increase Your Understanding – Impress Your Friends, Neighbors, and In-Laws!

To learn more about broadband and the Internet, check out our other fact sheets, case studies, reports, podcasts, and more on **MuniNetworks.org**

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WIRELESS INTERNET 101

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Wireless is the technology that today most resembles magic. We want to be mobile, not tethered. Our desires notwithstanding, the future of telecommunications is more complicated than simply removing wires.

Consider your home network. You likely use a Wi-Fi router to share a DSL or cable wired connection to your home. Even as wireless devices become increasingly common, most homes will still have a wired connection (ideally using fiber optics).

There is no single "wireless" technology. There are many different standards, speeds, and issues. Your phone may support 4G LTE, Wi-Fi, and Bluetooth – each is unique in capacity and limitations.

BASIC TERMINOLOGY

Spectrum: This is the entire range of electromagnetic wavelengths from the colors we see to frequencies used by radio and television broadcast stations. The Federal Communications Commission (FCC) regulates how the spectrum may be used and by whom.

Licensed spectrum: Specific ranges of radio wavelengths that may only be used by those holding licenses from the FCC. Technologies include 3G, 4G, LTE, WiMax, and others.

- **3G, 4G:** G is short for "Generation" of commercial cellular network. However, marketing departments have perverted these designations so the 4G used by AT&T is not the same as 4G used by Verizon, etc.
- **LTE:** "Long Term Evolution" is a wireless standard (4G) used by most cell phone companies to deliver cellular wireless services, most often to mobile phones.

Unlicensed spectrum: Specific ranges of radio wavelengths dedicated to a commons that anyone may use, often with power limits. Includes microwaves, garage door openers, Wi-Fi, cordless phones, and others.

- **Wi-Fi:** Sometimes confused with "wireless." Wi-Fi is a specific set of wireless protocols commonly used by computers and mobile devices. Many different firms manufacture Wi-Fi devices that meet standards to communicate with each other.

Fixed Wireless: Connects two non-mobile locations, such as between a house and tower. The antennas are often directional to allow higher power and faster speeds than used for mobile phones.

Data Caps: limits on the amount of data a device may use over a period of time.

KEY POINTS

Cell phones do not use satellites. The signal travels from your phone to an antenna, likely on a tower (as shown on left) within a few miles of your location.

Wireless networks require wires. When your cell phone connects to the tower, the signal travels via wires to a processing hub, then again via wires to another antenna to connect "wirelessly" to the call recipient.

Wireless networks require better fiber optic networks. The explosion of wireless demand requires higher capacity fiber optic connections to antenna sites. Wired and wireless networks complement each other; they are not substitutes.

Home Wi-Fi connections are often already faster than the Internet connection. Your wireless network may peak at 54 Mbps or more whereas your Internet connection may only be 5-10 Mbps.

REAL WORLD MEASUREMENTS

Today's mobile wireless technology alone does not meet our demand for fast Internet access. 4G wireless is slower than modern wired cable connections.

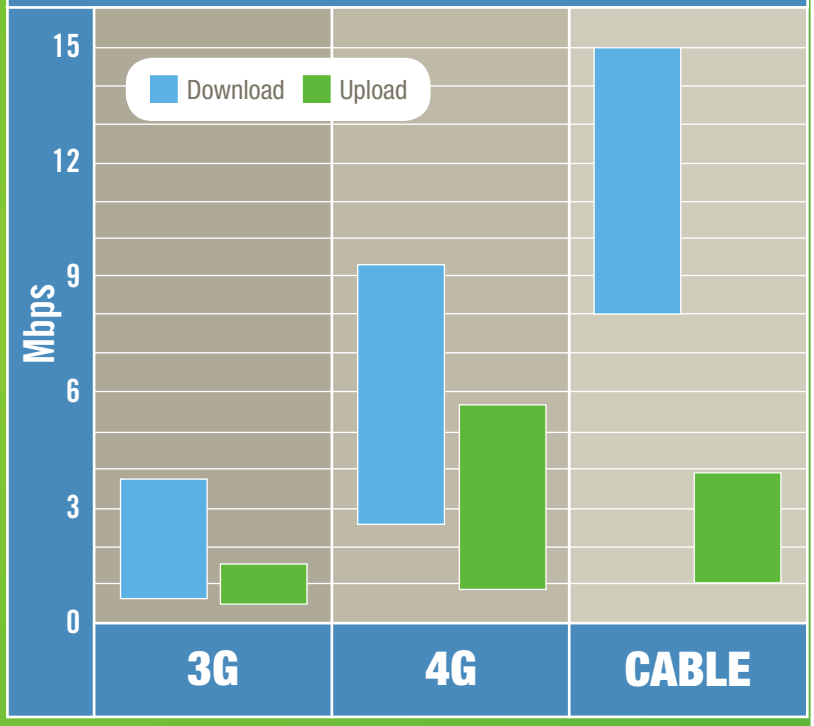
Though wireless speeds continue to improve, each tower is shared by many users whereas home wired connections are shared by comparatively fewer users. As a result, these wireless connections are unlikely to overtake modern wired connections in the home.

In 2012, PC World tested wireless Internet services from four mobile carriers in 13 U.S. cities. 3G was comparable to home DSL connections and 4G a bit slower than home cable connections. Both download and upload speeds were tested. Cable reference based on PC World tests of multiple cable companies' standard tier.

PC WORLD SPEED TEST RESULTS

3G Download / Upload	4G Download / Upload
Fastest: 3.84 / 1.44 Mbps	Fastest: 9.12 / 5.85 Mbps
Slowest: .59 / .56 Mbps	Slowest: 2.81 / .97 Mbps

COMMON SPEEDS (in Mpbs)



DATA CAPS

Wireless Internet providers often impose **data caps** that discourage subscribers from using certain applications, most notable streaming video. These are generally business decisions, not technical limitations. Nonetheless, they are a reason wireless is not replacing wireline connections at home.

Exceeding **data caps** results in overages or interruptions in service that make wireless alone an expensive solution for businesses that regularly transfer large amounts of data.

Wireless providers justify data caps as a means of managing **congestion**, but consumer advocate groups argue the real motivation is maximizing revenue. An analogy is trying to manage rush hour traffic jams by limiting how many miles one can drive per month.

WIRELESS LIMITATIONS

Objects such as trees, hills, and buildings can degrade wireless signals.

Satellite Internet service is wireless but is expensive and suffers from technical limitations. We have not found anyone subscribing to satellite Internet when a DSL or cable option was available.

Congestion can result when too many devices are attempting to share the same antenna. This can be resolved by deploying more antennas, each of which should have a fiber connection. Cities with ubiquitous fiber networks can offer better wireless options.

ADDITIONAL RESOURCES:

Collect all of our Internet-Related Fact Sheets at MuniNetworks.org/fact-sheets

Broadband Bits Interviews with Dewayne Hendricks

New America Foundation - Wireless Future Project

Public Knowledge - Mobile Innovation

Free Press - Save the Internet

For more information, visit MuniNetworks.org

@CommunityNets ; broadband@muninetworks.org

ILSR INSTITUTE FOR Local Self-Reliance

Next Century Cities

The Opportunity of Municipal Broadband

The Federal Communications Commission estimates that 21 million Americans don't have access to broadband internet (though this analysis has been widely proven to underreport the scale of the problem).[1] Municipal broadband networks provide an opportunity to connect the unconnected to the essential twenty-first century infrastructure. Over 500 municipalities have invested in creative public networks, using a variety of models to connect rural and underserved communities. Building a municipal network is rarely a community's first choice, but cities and towns have taken it upon themselves to connect residents to broadband when existing cable and telephone companies have chosen not to offer competitive services.

The Benefits of Municipal Networks

Municipalities use a variety of funding methods to build broadband networks. Most use funding mechanisms without direct taxpayer dollars, such as revenue bonds, loans, or Tax Increment Financing.

Longmont, Colo. financed its city-wide fiber network through revenue bonds, putting no financial burden on the taxpayer.[2] Residents in **Islesboro, Maine** voted to accept a slight property tax increase to finance the bond that paid for their fiber network. The cost of funding the bond was comparable to the price they had been paying for poor quality DSL service.[3]

For more information: How municipal networks are financed; Creative funding sources for fiber infrastructure

Municipal networks are not a small undertaking but can provide immense long-term benefits to a community even beyond improved internet access.

Chattanooga, Tenn.'s municipal network EPB not only retired its telecom debt, but revenues from fiber services were so high that the electric utility was able to forego several rate increases.[4] **Virginia Beach, Va.** leverages its fiber network to connect the city's government buildings, schools, fire stations, and more. By connecting these anchors directly as opposed to purchasing service from an ISP, the city saves at least $500,000 per year.[5] **Portland, Ore.** had been paying $1,310 per month per site to a private ISP to connect its schools. The district eventually switched to a publicly owned network, and was able to connect schools to a speed 40 times greater for just $616 per month per site.[6]

For more information: Municipal networks deliver local benefits; Community broadband creates public savings

Why We Need Broadband

Americans need access to broadband in order to start businesses, compete for jobs, complete homework assignments, apply for a mortgage, find a polling location, and much more.

Connecting Communities

Next Century Cities

The Benefits of Municipal Networks

Municipal networks provide the robust access necessary for job growth and economic development.

Lafayette, La.'s network helped attract new technology businesses to town, diversifying the local economy which had previously been dependent on oil and gas. In **Chattanooga**, the fiber network is estimated to have created up to 5,200 new jobs and up to $1.3 billion in economic and social benefits in the community between 2011-2015.[7]

Fiber utilities can drastically improve utility efficiency and city cost savings.

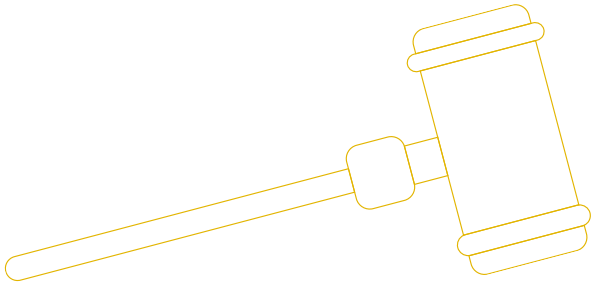
Lafayette's "smart" electric grid uses fiber to monitor power and alert the city when there's an outage. As a result, the average length of a power outage in **Lafayette** is one quarter the state average, which saves ratepayers about $25 million per year.

Locally owned networks are committed to local success.

Municipal networks are small, and the people who run them are members of the community themselves, creating a high level of visibility and accountability that is often not present with larger ISPs. Typically, the result is exceptional customer service, a vested interest in the community, and awards (see: Ammon, Id.; Longmont, Colo.; and Clarksville, Tenn.).

What's Holding Us Back

Municipal broadband networks present an opportunity to connect communities to this vital future-proof infrastructure —but many states have legislation in place that outright bans or de facto bars municipal networks from being built. Conservative analysis shows that over 11 million Americans—over half of the country's estimated unconnected population—who do not have access to broadband live in states where municipal networks are barred or outright banned by state legislation.



How States Can Help

States can facilitate connectivity by:

- Allowing local governments the authority to build and manage network infrastructure and offer broadband services
- Including municipal governments among eligible awardees in broadband grant and loan programs

Find more information about the hundreds of municipal broadband success stories from the Institute for Local Self-Reliance's Community Broadband Networks Initiative and from Next Century Cities.

Sources

[1] https://docs.fcc.gov/public/attachments/FCC-19-44A4.pdf
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F. GLOSSARY

GLOSSARY

ADSL: Asymmetric Digital Subscriber Line - This is a type of digital communication technology used for transmitting digital data over traditional copper telephone lines. ADSL is a common method for providing high-speed internet access to homes and businesses. The term "asymmetric" in ADSL refers to the fact that it allows for different data transfer rates in the upstream (from the user to the internet) and downstream (from the internet to the user) directions. Typically, ADSL provides a much faster downstream speed compared to the upstream speed. This is because it is designed to cater to the typical internet usage pattern where users download more data (e.g., web pages, videos, and files) from the internet than they upload.

Backhaul: Backhaul refers to the part of a telecommunications network that connects the core or backbone network to smaller subnetworks or distribution points. It is a crucial component in the overall network infrastructure, as it facilitates the flow of data between various network segments, ensuring efficient data transport.

Bandwidth: commonly refers to the speed of internet service, measured in bits per second.

Broadband: Commonly refers to high-speed internet access that is always on and faster than traditional dial-up access. Broadband includes several high-speed transmission technologies, such as fiber, wireless, satellite, digital subscriber line, and cable. For the Federal Communications Commission (FCC), broadband capability requires consumers to have access to actual download speeds of at least 25 Mbps and actual upload speeds of at least 3 Mbps.

Broadband Adoption: The use of broadband in places where it is available, measured as the percentage of households that use broadband in such areas.

Broadband Serviceable Location (BSL): a business or residential location in the United States at which mass-market fixed broadband Internet access service is, or can be, installed.

CO: Central Office - is a facility used by a telecommunications service provider to manage and distribute telecommunications services, including landline telephone, broadband internet, and sometimes other services like DSL, ISDN, or traditional fax services. These central offices play a critical role in connecting customers to the larger telecommunications network.

Dark Fiber: Unused fiber infrastructure that has not been "lit" with Internet service. When someone is building a fiber network, the cost of adding more fiber than immediately required is negligible and the cost of having to add more fiber later is very high. Therefore, many include dark fiber in projects – fibers that can be leased to others or held in reserve for a future need.

Digital Divide: The gap between those of a populace that have access to the internet and other communications technologies and those that have limited or no access.

Digital Equity: Parity in digital access and digital skills that are now required for full participation in many aspects of society and the economy. Digital equity links digital inclusion to social justice and highlights that a lack of access and/or skills can further isolate individuals and communities from a broad range of opportunities.

Digital Inclusion: Access by individuals and communities to robust broadband connections; internet-enabled devices that meet user needs; and the skills to explore, create, and collaborate in the digital world. Digital inclusion programs can be used to promote digital equity.

Digital Literacy: The ability to leverage current technologies, such as smartphones and laptops, and internet access to perform research, create content, and interact with the world.

Download Speed refers to the rate at which digital data is transferred from the Internet to a computer. How quickly you receive online data like texts, images, and videos is based on download speed.

DSL: Digital Subscriber Line - DSL refers to a technology that provides high-speed internet access over traditional copper telephone lines. It allows for a faster internet connection than dial-up and is a common method for broadband internet access in many areas.

FTTC: Fiber to the Curb (or Cabinet) - It is a broadband internet service delivery architecture that combines fiber-optic technology with traditional copper or coaxial cables to provide high-speed internet access to homes and businesses.

FTTH: Fiber to the Home - It is a type of broadband internet service delivery architecture that uses optical fiber cables to provide high-speed internet access directly to residential homes and businesses.

FTTN: Fiber to the Node - It is a broadband internet service delivery architecture that combines fiber-optic technology with traditional copper or coaxial cables to provide high-speed internet access to homes and businesses.

FTTP: Fiber to the Premises – same as FTTH is a broadband internet service delivery architecture that provides high-speed internet access by extending fiber-optic cables directly to residential homes, businesses, or other types of properties.

Gbps: Gigabits per Second - It is a unit of data transfer speed used to measure the rate at which data is transmitted or received over a network or data connection. A gigabit is a unit of digital information that represents one billion individual bits.

Gig- Shorthand for 1 gbps (1,000 mbps) download speeds. More colloquially, a speed fast enough that any number of applications can use the network without creating congestion.

HFC: Hybrid Fiber-Coaxial – same as FTTN

Internet Service Provider (ISP): an entity that provides access to the internet and the services available, which a customer buys internet from.

IoT: Internet of Things - It refers to a network of physical objects or "things" that are embedded with sensors, software, and other technologies to connect and exchange data with other devices and systems over the Internet. These objects can be everyday items such as appliances, vehicles, wearable devices, industrial machines, or even buildings.

Jitter: Jitter refers to the deviation or variability in the timing or periodicity of a signal or event. It is commonly used in the context of digital data transmission, electronics, and telecommunications. Jitter can manifest as small, random variations in the timing of signal edges, which can lead to problems such as data errors or reduced performance in various systems.

Latency: is a measure of the delay or lag in data communication over the internet or any other network. It represents the time it takes for data to travel from the source (sender) to the destination (receiver) and back. Latency is typically measured in milliseconds (ms).

LOS: Line of Sight - refers to the unobstructed and direct path between two points that enables visual or electromagnetic communication. Line of sight is important in fields like wireless communication and optical communication, where obstacles or terrain can block signals.

Mbps: Mbps: Megabits per Second - t is a unit of measurement used to express data transfer speeds in telecommunications and computing. Megabits per second measure the rate at which data is transmitted or received over a network or data connection. A megabit is a unit of digital information that represents one million individual bits.

PING: Packet Internet Groper - When you PING a host, your computer or device sends a small data packet to the target host's IP address and waits for a response. The primary purposes of using the PING command are checking network connectivity and measuring latency.

Public Service Commission (PSC): an agency responsible for the regulation of Wisconsin public utilities, including those that are municipally owned. The PSC staff's the Wisconsin Broadband Office (WBO), which leads statewide efforts to expand access, adoption, and affordability. WBO provides support to residents seeking internet access, manages broadband grant programs, compiles broadband service maps, and builds capacity through planning and outreach.

RF: Radio Frequency refers to the range of electromagnetic frequencies that are commonly used for wireless communication and broadcasting. RF waves are a type of electromagnetic radiation, which includes various forms of energy traveling through space in the form of oscillating electric and magnetic fields. RF waves occupy a specific portion of the electromagnetic spectrum, typically ranging from about 3 kilohertz (kHz) to 300 gigahertz (GHz). This range includes frequencies commonly used for radio broadcasting, television, cellular communication, Wi-Fi, and many other wireless technologies.

SDSL: It is a type of digital communication technology that provides high-speed internet access over standard copper telephone lines. Unlike Asymmetric Digital Subscriber Line (ADSL), which offers different upload and download speeds, SDSL provides equal upload and download speeds. This symmetry is particularly advantageous for businesses and applications that require consistent data transfer rates in both directions.

SVI: Social Vulnerability Index (SVI) is a widely used tool in the field of disaster management and public health that assesses the vulnerability of communities to various natural and man-made hazards. It was developed by the Centers for Disease Control and Prevention (CDC) in the United States and is primarily used for disaster preparedness, response, and recovery efforts.

Upload Speed: refers to the rate at which online data is transferred from a computer to the Internet. Sending emails, video calling, and uploading pictures to the internet requires good upload speed.

VDSL: Very-high-bit-rate Digital Subscriber Line - It is a type of digital subscriber line (DSL) technology used for high-speed internet access over traditional copper telephone lines. VDSL is an improvement over earlier DSL technologies like ADSL (Asymmetric Digital Subscriber Line) and SDSL (Symmetric Digital Subscriber Line) in terms of data transfer rates.

Wi-Fi: a technology that produces a wireless local area network allowing a computer or other device to connect to the internet wirelessly. Equipment in the device communicates with the Wi-Fi router, which is connected to the network with some type of physical cable or wire. Examples include the Wi-Fi in a home or hotspot at a coffee shop.