

WE ARE PROUD OF WHAT WE ACCOMPLISHED THIS YEAR!

- Total Wireless Customers - 9,087
- Total Live Towers - 381
- Fiber Internet went live in Iowa and Forest Counties
- Community Impact Reports made available monthly for 8 counties
- New website launched (www.btussel.com)
- Updated Rhinelander office signage (from Northwoods Connect to Bug Tussel)
- Donated back to our communities through our donation program
- Attended WPS Farm Show, WI Farm Technology Days, Hodag, Country Boom, and more
- Sponsored 21 local community events
- Race car sponsors for River Valley Racing, Crystal Zemple #33Z, and Corey Manders
- Bug Tussel University Classes and growth: 81 classes, 230 attendees

UPCOMING BUG TUSSEL UNIVERSITY CLASSES

- Extra, Extra! Get Your News Online! | 1/12 | 10:00 a.m. | Brillion Public Library
- Fun with Photos | 2/6 | 11:00 a.m. | Brillion Public Library

Learn about our upcoming classes at btussel.com/free-tech-education/attend-a-class



\$500 raised for CASA of Brown County at Bug Tussel's employee holiday party on 12/10

COUNTY PARTNERSHIP

Bug Tussel is a proud partner of Calumet County!

- 2021 Bond

The project, **R.O.A.D. to Digital Equality**, will equip the county with fixed wireless sites to facilitate rapid expansion, with options for expansion available as agreed upon by Bug Tussel and the county. These fiber project will cover more than 75 miles throughout the county and will provide a catalyst for future last-mile expansion.

SUBSCRIPTIONS

Over 650 fixed wireless subscriptions.

MARKETING & SALES

Ads & Sponsorships

- Daily Facebook wireless internet ads
- Facebook ads for holiday promotion
- Door hangers and flyers shared for holiday promotion
- January radio ads updated
- WPKR studio sponsor and two monthly ads
- Print and email banner ads in Insight on Business Magazine
- TV commercials streaming on Fox 11 WLUK.
 - Net reach over 160,000.

YOUR SALES REPRESENTATIVES



SCOTT NASGOVITZ

(920) 530-1311

Scott.Nasgovitz@btussel.com



KRISTIN LAMBRECHT

(920) 501-8515

Kristin.Lambrecht@btussel.com

GET IN TOUCH

CUSTOMER SERVICE

(877) 227-0924

customerservice@btussel.com

btussel.com

Towers

On Air: 7

- Tower construction and installation complete.
- Internet is live and operational.
- Customers are ready to be connected, with unique installation for each connection taking additional time.

Construction: 2

- Design and plan the tower build (civil construction).
- Construct tower by stacking from bottom to top.
- Install utilities such as equipment, antenna and lines.
- Integrate connections to internet network.

Zoning: 0

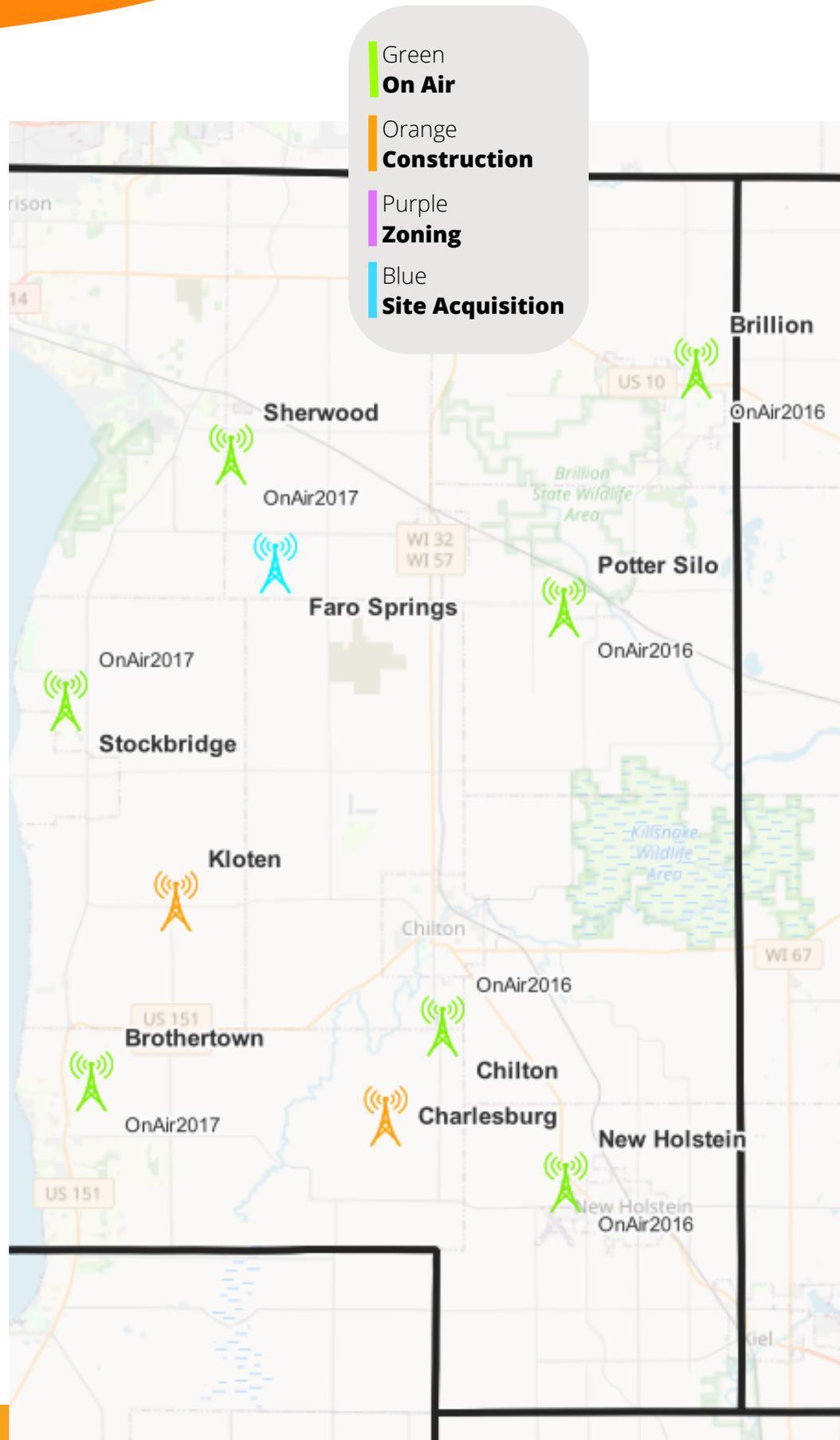
- Submit permits.
- Awaiting approval from local and federal agencies.

Site Acquisition: 1

- Search for and determine tower site.
- Negotiate and sign lease in cooperation with landowner.



photograph by Andre Netz



*This map includes a rough estimate of site locations and may not accurately reflect actual tower placement.

Site Acquisition Timeline



6-12 MONTHS

BOND EFFORT

Meet with county and municipalities, plan funding, provide due diligence, plan county network (towers and fiber). Several votes with different county committees. Final county board vote (often requires supermajority).



1-3 MONTHS

SEARCH

Connect with property owners within a search ring (about 1 month). Evaluate properties, choose preferred location (about 1 month).



1-3 MONTHS

LEASING

Work with landowner to agree to tower layout, lease terms, address title issues, etc. Often requires attorney review.



6-12 MONTHS

GOVERNMENT APPROVALS

Obtain local permits (driveway permit, address, zoning/conditional use permit, etc). Often requires public notice and hearings.

Obtain federal regulatory approval, including from FAA, FCC, EPA, and other entities. Requires on-site soil, archeological, geologic, historical, etc. studies.

UPDATES

Progress has slowed due to wintery conditions and crews off for the holidays.

Completion of the Middle Mile (backbone) and Last Mile (distribution) in the county is anticipated in late summer 2023.

Connected:

- Fiber network is complete and connected.
- Internet is live and operational.
- Customers are ready to be connected, with unique installation for each connection taking additional time.

Fiber:

- Fiber is sent through installed conduit via fiber blowing, a technique using a machine on wheels that blows air to push the fiber through the cable.
- Sections of fiber are connected to each other via Splicing, the fusion of fiber with an optical laser.

Conduit:

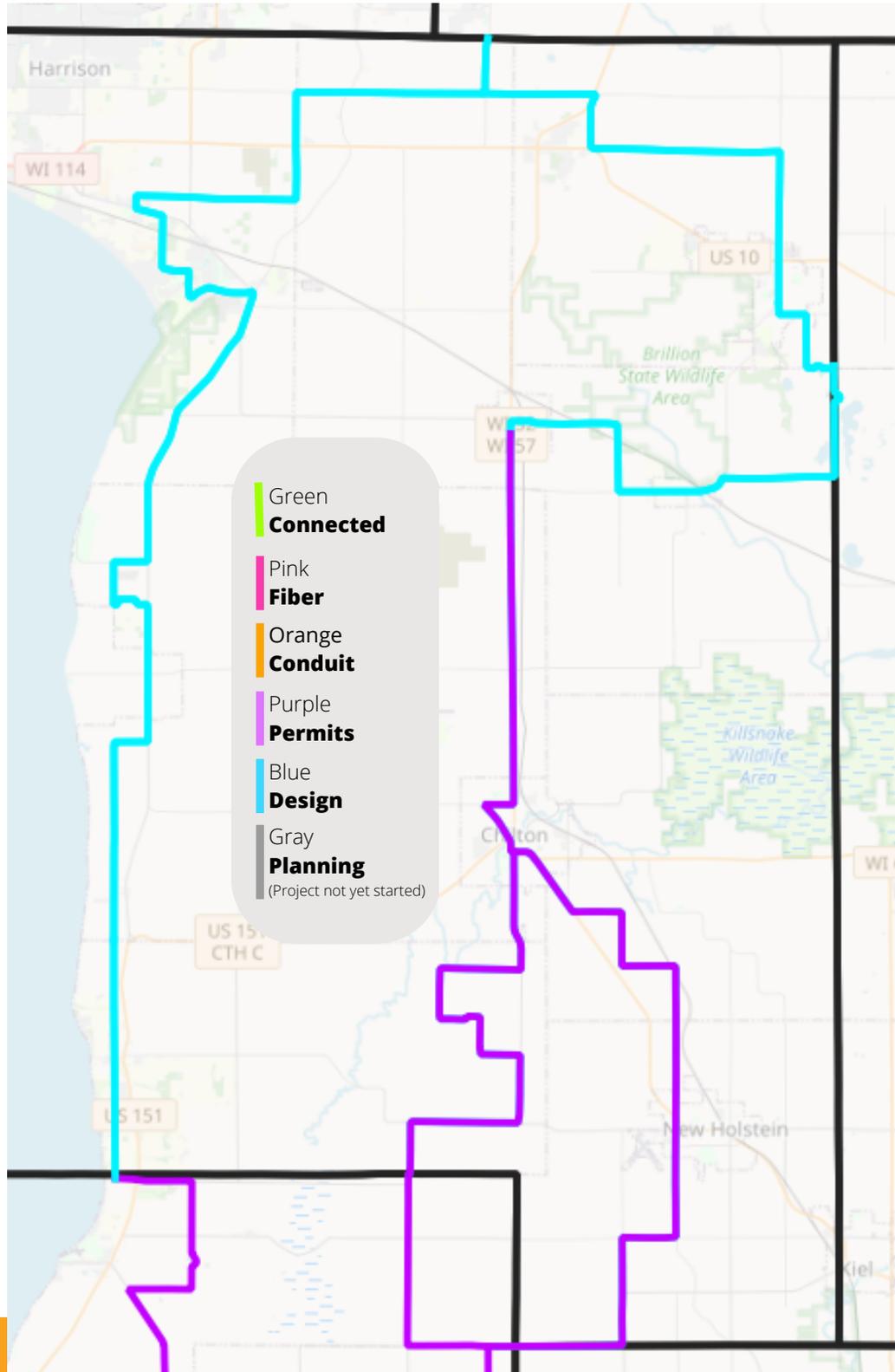
- Conduit, the protection cable that will house the fiber, is installed via boring (with a drill) or plowing.
- Access hatches that house utilities and connections (such as handholes, flowerpots, and cabinets) are installed.

Permits: 20 miles completed

- Permits for work in areas along the route are submitted.
- Awaiting approval from local and federal agencies.

Design: 80 miles completed

- Fiber route is mapped.
- Route is traveled to determine equipment and landscape needs.
- Sections are re-designed as needed.



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How is a Fiber Network Created?

Did you know? A fiber network is like a highway system. 

Long Haul Fiber is like an *expressway* connecting main points across very large areas together. This is the *core* network that hooks up internet connections from state to state and, on a larger scale, country to country.

 The **Middle Mile** is like a *highway* connecting cities together. This is the *backbone* that connects cities, counties, and states and creates a national network.

The **Last Mile** is like a *road* that travels from the highway to individual neighborhoods, including FTTH (fiber-to-the-home), FTTP (fiber-to-the-premises), etc. This is the *distribution* that connects the internet network to customer's homes, businesses, and government agencies. This is often the costliest and most challenging part of the network to create.

**Bug Tussel specializes in building Middle Mile and Last Mile networks.*

Installing a fiber network requires 4 major steps:

DESIGN THE ROUTE, OBTAIN PERMITS, INSTALL FIBER, AND CONNECT TO CUSTOMERS.

DESIGN THE ROUTE *(Engineering)*

Map the Route

Determine the best route for the network and outline in advanced mapping software.



Travel the Route

Travel the route to determine equipment and route needs based on the landscape. For example, areas with hard rock conditions will require specialized equipment such as a directional drill.

Update Design

Route design is then updated as needed based on landscape requirements, permit needs, etc.

OBTAIN PERMITS *(Zoning)*

Submit Permits

Submit permits to local and federal agencies in order to obtain authorization before beginning installation.

Await Approval

Await approval and re-submit or re-design if approval is denied.



INSTALL FIBER *(Construction)*

Deploy Conduit

Install conduit (a protective cable that will house the fiber) into the ground via plowing or boring (with a directional drill).

Install Access Hatches

Place access hatches in areas (often underground) where intersections will be made, the route changes direction, or fiber will be dispersed. These hatches (which include handholes, flowerpots, and cabinets) will act as utility boxes where fiber connections can be made.

Insert Fiber

Run fiber through the conduit. The most common way to insert fiber is through a process called fiber blowing, which uses a machine to move the fiber through the cable via bursts of air. This reduces friction and the risk of damage to the fiber.

Connect Fiber

Connect sections of fiber to one another by splicing, the process of fusing pieces of fiber together with an optical laser.

Connect to the Internet

Connect the fiber route to the internet, often by hooking up to the larger worldwide network via connection to a switch, a mobile tower, or another connecting point.



CONNECT TO CUSTOMERS *(On Air)*

Connect to Customer

Install fiber from the closest access point (a handhole) to customer's ONT (optical network terminal, which converts light signals to electrical signals) in their home or business.

Set Up Internet

Customer sets up home network system through router and ONT connections.

