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Broadband Community Profile

# Westfield, Massachusetts: Leading with Fiber

May 2022

Research Series Presented by

FiberBroadband ASSOCIATION

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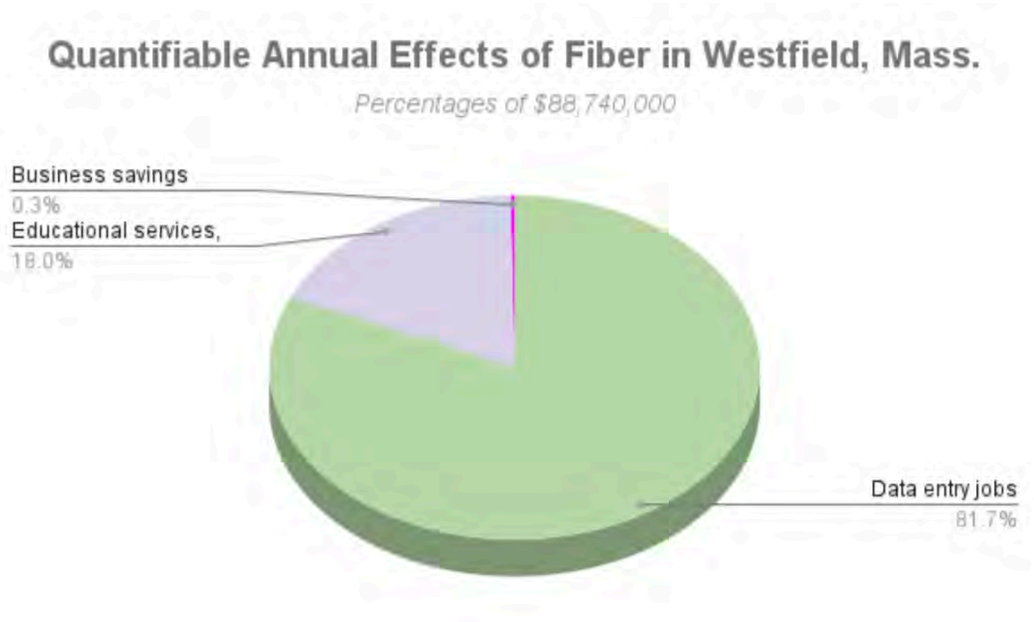
# Executive **Summary**

- The small city of Westfield, Mass., has realized over $88 million annually in job-related benefits from the installation of fiber optic broadband.
- Westfield was among the first cities in the state of Massachusetts to offer symmetrical 1-Gb/s fiber broadband.
- As demand grows, 10-Gb/s Internet can be installed with a software upgrade, thanks to the fiber infrastructure.
- The route to fiber was led by Westfield Gas & Electric (WG&E), which created a subsidiary called Whip City Fiber to launch fiber broadband.
- WG&E learned about fiber by starting with transforming its own utility network.
- Westfield's successful fiber broadband rollout has been duplicated with help from Whip City Fiber throughout 20 nearby towns.
- Westfield's Whip City Fiber draws revenue from the sale of dark fiber to local entities that require private networking.
- Westfield is served by gigabit passive optical network (GPON) equipment from Nokia (NYSE: NOK) and CommScope (Nasdaq: COMM). The PON design, fed by fiber from Furukawa Electric subsidiary OFS, splits lightwaves into segments that are then transmitted to customer sites.




Internet connectivity is a necessity in twenty-first-century America. We work and attend school online. We conduct meetings, share information, access entertainment, and, increasingly, obtain vital services such as healthcare on the web. Yet even as our dependence on the Internet grows, some areas of the U.S. remain without the necessary infrastructure to keep pace.

Not all of these Internet deserts are rural. In smaller cities, incumbent Internet service providers (ISPs) can dominate the market, declining to upgrade services beyond the minimum speeds allowed for broadband by the U.S. Federal Communications Commission (FCC).

## Westfield, Mass. by the Numbers

Area: 46.2 square miles
Population: 40,834 as of April 1, 2020
County seat: Springfield, Mass.
Median home value: approx. $299,900
Median age: 39.3 years
Median household income: $74,456
Percent of homes with broadband Internet: 87.3%
Poverty level: 6%

## Fiber in Westfield, Mass.

Current Size of network: 152.2 miles, 3 points of presence, 32 subdivisions
Approximate total cost of network to date: $19.6 million
Annualized cost of network to date: $2.8 million
Cost per subscriber: $1,452

According to some experts, those speeds of 25 Mb/s download, 3 Mb/s upload are proving insufficient in this era of work-from-home and remote learning (which frequently occur simultaneously). Further, the discrepancy between download and upload speeds is increasingly viewed as outdated.[1]

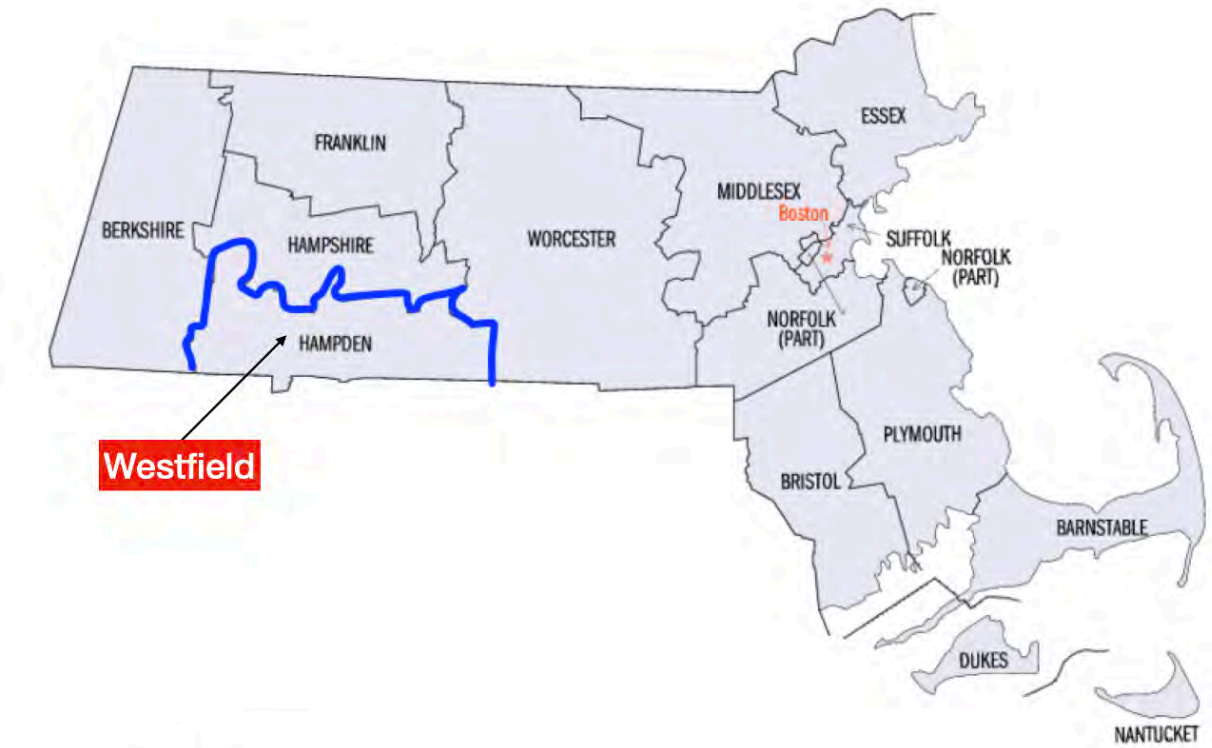
Pricing is also an issue. In some cities, incumbent carriers or cable providers offer faster broadband but charge high prices for it, creating a digital divide between those who can afford the service and those who cannot.[2]

This study describes how one small community in western Massachusetts addressed the need for reasonably priced high-speed symmetrical broadband service through the installation of a fiber optic infrastructure that not only serves the city but has prompted and facilitated similar fiber adoption throughout the region. Through a carefully conceived and cleverly executed plan sponsored by a local utility, Westfield, Mass., became one of the first cities in the state to offer 1-Gb/s symmetrical Internet connectivity to residents, schools, hospitals, and businesses. While the region continues to benefit from existing service, a full 10-Gb/s will soon be available through a simple software upgrade for existing equipment.

[1] According to a dissenting opinion by FCC Commissioner Jessica Rosenworcel, “Many households with multiple users are calling, watching, listening, gaming, and searching online all at the same time…. But the FCC has been sticking with a download standard of 25 megabits per second that it adopted more than five years ago…. We need to reset it to at least 100 megabits per second. While we’re at it we need to revisit our thinking about upload speeds. At present, our standard is 3 megabits per second. But this asymmetrical approach is dated.” See References.
[2] Referring to the Biden administration’s broadband funding plan, New York Times reporter Eduardo Porter wrote: “Billions will be spent to extend the internet infrastructure to the farthest reaches of rural America, where few people live, and little will be devoted to connecting millions of urban families who live in areas with high-speed service that they cannot afford.” See References.

**How Fiber Came to Westfield**

Westfield is a city of over 40,000 spanning roughly 46 miles in Hampden County in the Pioneer Valley of southwestern Massachusetts. Bordered on the west by the Berkshire Mountains and on the east by the suburbs of Springfield, Mass., Westfield, along with counties Hampshire and Franklin to the north, is also part of the Springfield Metropolitan Statistical Area (MSA), the center of which is located just 26 miles northeast of Hartford, Connecticut.




*Source: Wikimedia Commons*

Westfield was settled by Europeans in 1660 but was not officially founded as a municipality until 1920. During the nineteenth century, the city became famous for the manufacture of buggy whips, leading to its nickname of Whip City. Over the twentieth century, other forms of manufacturing replaced the whip trade, and at present Westfield is known as a center for precision manufacturing, among other businesses.

Westfield Park Square, Westfield, Mass. *Source: Jeff Jason II (jeffjason.com) AKA UmassThrower (talk); Creative Commons Attribution-Share Alike 3.0 license.*

Despite Westfield's urban status, it was slow to get high-speed Internet. By the early 2000s, DSL, satellite, and cable Internet were available, but prices were high and speed and reliability were issues. By 2013, citizens were discussing the need for change.

The city's major utility, Westfield Gas & Electric (WG&E), took the initiative to provide service to the community. "We considered some of the things we could do as a municipal utility that would bring value to the community and value to the organization," said John Leary, information technology manager at WG&E. "We wanted an Internet service that was future-proof and cutting edge."

Fiber fit the bill. Not only would it substantially improve Internet performance near term, but it would also guarantee a future upgrade path to higher speeds with minimal impact to infrastructure. WG&E already had the trucks and the poles to string fiber. It also had experience as an Internet service provider (ISP). To augment its utility services in the mid-1990s, WG&E offered DSL running on leased lines from incumbent carriers AT&T and New England Telephone and Telegraph.

WG&E also had fiber expertise. It installed a fiber SCADA (supervisory control and data acquisition) network to automate its utility services in the 1990s. Then, starting in 2005, the company constructed a 60-mile network of interlocking fiber rings in Westfield linked to the company's network and to the city's municipal buildings and at least one business customer, a local manufacturing firm.

The goal of the fiber was multipart: It was the basis for a private, high-speed wide-area network (WAN) for local government and business.

It reduced reliance on expensive telco services, brought revenue to WG&E, boosted utility automation, and improved service to the community. It also gave WG&E experience with fiber. And that prompted the company to suggest a pilot project to test fiber broadband when it was time to move to faster, more reliable Internet.

> "We wanted an Internet service that was future-proof and cutting edge."
> -John Leary,
> Information Technology Manager at WG&E

**A Successful Pilot Leads to Fiber Rollout**

In early 2015, WG&E began its pilot fiber-to-the-home (FTTH) project. A division of the company named Whip City Fiber was established, and WG&E loaned it $2 million to fund the pilot. Service was set up for a test group of homes representing a mix of incomes and other demographics.

City residents raved about the service. Indeed, the pilot was so successful that WG&E got permission from the Municipal Light Board, its governing organization, to petition the Westfield City Council for a $15 million bond to fund an official rollout of services. By 2017, the bond was approved for use by Whip City Fiber to cover 70% of the city with fiber optic cabling for an ISP service.

Whip City Fiber, managed by employees of WG&E now doing double duty at the new business unit, proceeded with a careful, focused plan to acquaint the community with its goals. The division issued direct mail, printed pamphlets, and ran a website campaign asking people to respond if they were interested in the new fiber-based Internet service. "That showed us where in the city to go first, where we would get the most customers," said John Leary.

Whip City Fiber also engaged in other outreach efforts to educate residents and help promote the new service. At least four times a month, workshops were held at local elementary schools or libraries to explain the process of installing fiber -- and what the resulting benefits would be. Over cupcakes or ice cream, residents learned how fiber trenching might affect their lawns (or not), and they were introduced to the advantages of 1-Gb/s service, including streaming video. The community interaction helped raise Whip City Fiber's profile, and its adoption rate, or "take rate," grew to over 40% in Westfield.

## Whip City Fiber Fact Box

Headquarters: Westfield, Mass.
Subscribers: over 5,800 in Westfield, over 7,700 in surrounding partner communities
Take rate: approx. 40% in Westfield, 68% in partner communities
Annual revenue: $2 million to $4 million
Employees: < 25


WG&E engineers pull fiber during network installation. *Source: Westfield Gas & Electric/Whip City Fiber*


A WG&E truck ready to help install fiber. *Source: Westfield Gas & Electric/Whip City* Fiber

As enthusiasm for the new service rose, so did ire from incumbent cable ISP Comcast (Nasdaq: CMCSA), whose service covered close to 100% of the city. “We were a fledgling company trying to take them on,” said Lisa Stowe, manager of marketing, communications, community outreach, and grants at WG&E. “Comcast wasn’t delighted.” The cable provider hit back with a prominent billboard and ads in the local paper criticizing upstart Whip City Fiber, but the effort failed to hinder the fiber momentum.

Whip City Fiber countered Comcast’s objections not only with the advantages of fiber over cable, but with the assurance that their service had a local flavor. “Most of our customer service reps and technicians live in town, so it really gives us a local presence,” noted Stowe. And when service is needed, a live technician is ready to come out right away, not a day later.

> “This was a homegrown project with homegrown support, and that made a lot of difference here.”
> -Lisa Stowe,
> Manager of Marketing, Communications, Community Outreach, and Grants at WG&E

The FTTH project proceeded successfully. Three hub locations, or points of presence (PoPs), were established to house the active electronic components of the network, which was divided across a range of neighborhoods dubbed “fiberhoods.” A full 6.8 miles of fiber were installed underground, with additional fiber strung on utility poles. This fiber was in addition to the existing fiber optic rings serving the city’s municipal network, which would now be given the option of using Whip City Fiber ISP services.

Gigabit passive optical network (GPON) equipment from Nokia (NYSE: NOK) and CommScope (Nasdaq: COMM) was set up for the “last mile” fiber linking the network to individual homes and businesses. The PON design features optical line terminals (OLTs) that use passive optics to split lightwaves into segments that are then transmitted via optical network terminals (ONTs) to customer sites.

Fiber for Westfield’s network has been primarily supplied by Furukawa Electric subsidiary OFS. Installation of the fiber has required multiple contractors, including Sertex Broadband Solutions, based in Plainfield, Conn.; TriWire Engineering Solutions of Tewksbury, Mass.; and White Mountain Cable Construction, headquartered in Rising Sun, Md.

Today, Whip City Fiber offers a range of services, including residential Internet and voice-over-IP (VoIP) service, and a tiered series of business services supporting small, medium, large, and enterprise-size organizations. Installation and WiFi are free to residential and small business customers. Managed service plans are available for larger entities. Whip City Fiber accepts payments from the FCC’s Affordable Connectivity and Lifeline programs for low-income consumers. Whip City fiber also sells dark fiber for private WANs (see sidebar on following page).

Whip City Fiber remains a profitable business unit of WG&E. But any revenues it earns are rolled back into the fiber business. Typically, $2 million to $4 million annually are reinvested to keep ahead of the ongoing fiber rollout. Whip City Fiber anticipates serving 100% of Westfield by 2025.

## Dark Fiber in Westfield

As part of the fiber infrastructure, Westfield has available "last mile" dark fiber, which can be hooked to networks from other carriers as part of a private WAN. This presents an attractive alternative to businesses that require private fiber networks but would like to save the expense of having a last mile solution installed by a larger carrier or fiber provider. So far, the dark fiber opportunity has been limited to medical facilities, a regional bank, and a local manufacturing firm with multiple sites in the city. As the need for secure networking grows, however, it's likely more businesses could opt for their own fiber, especially if Whip City Fiber can add in 1-Gb/s Internet.

Reels of fiber optic cable in WG&E facility. *Source: Westfield Gas & Electric/Whip City Fiber*

## Fiber to the Rescue During COVID-19

When the COVID-19 pandemic hit in 2020, the resulting lockdowns had Westfield residents working from home and supervising remote classroom activities for their children. To help connect residents and students not yet hooked to its fiber broadband service, Whip City Fiber installed hotspots around the city. Also, to service homes not yet on the network without entering residences, the division devised a solution called a Teambox, comprising a weatherproof box mounted on the side of a house. Each box contained a gigabit passive optical network (GPON) component called an optical network terminal (ONT) and a router. The box was linked with fiber to the nearest utility pole on one side. On the other side was a power cord that a resident could pull through a window to an electrical plug. This setup enabled residents who had not yet been hooked to Whip City Fiber's network to be attached to high-speed Internet until full installation could be completed once

**A Fiber Project Heads for the Hills**

In 2018, the State of Massachusetts issued a request for proposal (RFP) for ISPs to bring broadband Internet to underserved townships outside Westfield, in the area known as the "hill towns" of the Berkshire Mountains.

"These towns were dying," said John Leary. "People went to college and didn't move back. No one was moving in. These were towns where children had to go to the local library to get Internet access to finish their homework."

Whip City Fiber responded to the RFP with a unique proposal: The division would act as a project manager for each town, helping each to create its own network.

## Massachusetts Partner Communities Served by Whip City Fiber 2022

| | | |
|---|---|---|
| Alford | Cummington | Plainfield |
| Goshen | Washington | Rowe |
| Ashfield | Heath | Wendell |
| Becket | Leyden | Windsor |
| Blandford | New Ashford | |
| Charlemont | New Salem | |

In effect, each town would follow the Westfield pattern to successful fiber installation, but the network would belong to the town alone. Each municipality would have the option to choose Whip City Fiber as its ISP once the network went live.

The proposal was offered to 40 of the Berkshire hill towns, and 20 responded favorably, including two towns that had the option of going with Comcast at no cost, since the state would have paid for cable Internet installation. These two towns voted to build their own fiber optic networks with guidance from Whip City Fiber.

So began a four-year project during which Whip City Fiber walked each town, or partner community, through setting up a fiber network, from selecting locations to mapping, designing, and building out the network, then getting it connected to each house and business as needed. Each town paid Whip City Fiber for its consulting, generally a percentage of the project cost. As projects were completed, 19 of the 20 initial partner communities also opted to retain Whip City Fiber as their ISP.

During the process of starting the partner community project management, Whip City Fiber applied for and received a $10 million grant from the federal Connect America Fund Phase II program for use by the partner communities. This money is held in a bank account by the City of Westfield, which takes Whip City Fiber payments for services from the fund and gives the rest to each town as required for each project.

**Westfield, Mass. Fiber Timeline**

**Mid-1990s**
Westfield Gas & Electric (WG&E) installs fiber to support supervisory control and data acquisition (SCADA) within the utility's network. WG&E also partners with phone companies to offer DSL to its customers.

**2005**
WG&E begins installation of 60 miles of fiber in three interconnected rings linked to municipal buildings in Westfield and to the utility's own network.

**2013**
Westfield residents start exploring options for alternative broadband Internet service in the city.

**2015**
WG&E is given permission by the Municipal Light Board to conduct a fiber optic broadband pilot project within Westfield.

**2016**
WG&E funds its pilot project with an internal loan of $2 million to newly formed division Whip City Fiber. Municipal Light Board gives permission for WG&E to petition the Westfield City Council for a bond to fund a full-scale fiber rollout.

**2017**
Westfield City Council votes to approve WG&E request for a municipal bond of $15 million to fund a fiber infrastructure to cover 70% of Westfield. A 25-year business plan is created with construction and adoption goals established.

**2018**
The success of the fiber rollout, as well as a government request for proposal (RFP), prompts Whip City Fiber to extend its services as a project manager to 40 municipalities in the western Berkshire Mountains region. Twenty accept the proposal. Whip City Fiber obtains $10 million in 10-year grant federal funding for these partner communities.

**2019**
The first hill towns, or partner communities, go live with their own fiber-optic networks; Whip City Fiber acts as ISP, though each city owns its own network.

**2020**
Whip City Fiber extends hotspots and temporary fiber optic extensions to Westfield and partner communities for both residents and businesses not yet connected to the fiber network, allowing for remote work during COVID-19 pandemic.

**2021 to Present**
Westfield plans further expansion of 10-Gb/s capacity within existing fiber optic infrastructure. Whip City Fiber anticipates having fiber-based broadband Internet service available to all of Westfield by 2025.

**Gauging the Impact of Fiber in Westfield**

Fiber broadband has benefited Westfield and the nearby partner communities in a variety of ways. Some are not easily quantifiable: How can one gauge the value of an emergency dispatch center or the local police detachment? Can one really quantify the value to families of having each one of thousands of children do homework easily on a district-issued Chromebook? Still, in some areas, such as employment, benefits can be more easily measured. Following is a sampling of both types of benefits to Westfield.

**Employment**

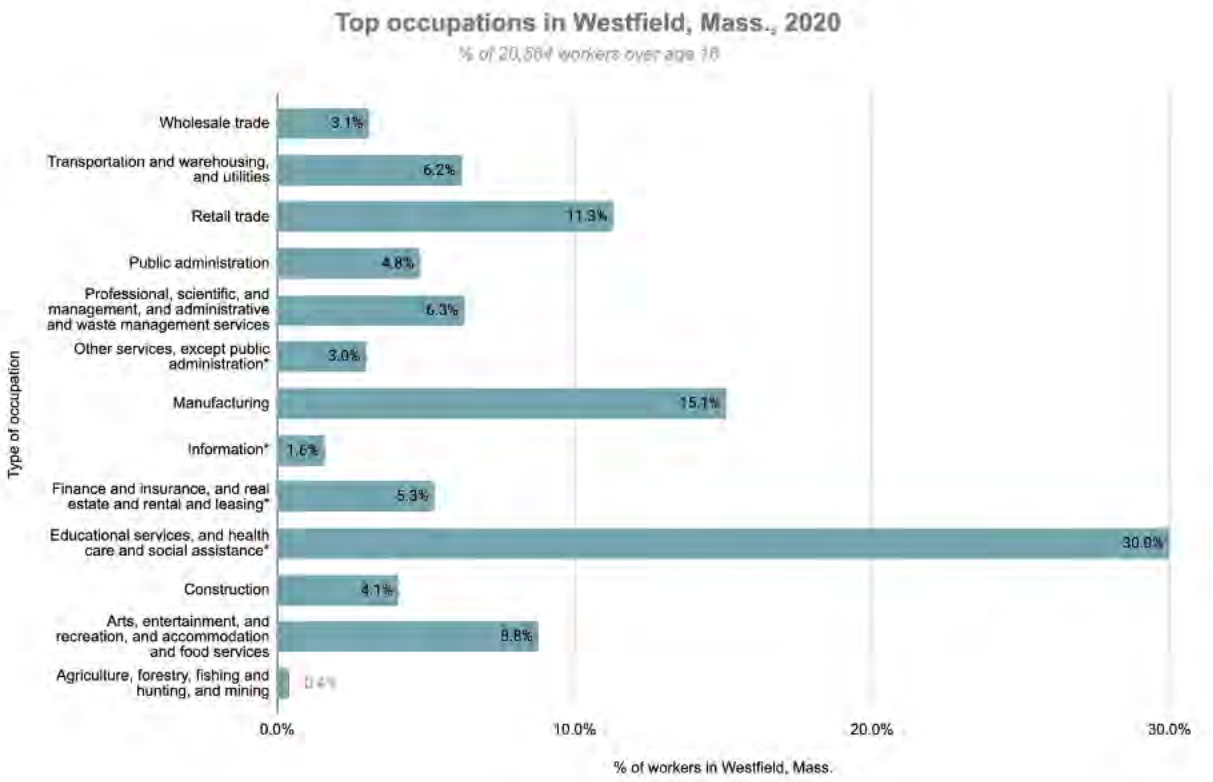
The nationwide work-from-home (WFH) trend set in motion during the COVID-19 pandemic highlighted Whip City Fiber's residential broadband as a vehicle for employment. Demand for data entry, a field that requires reliable high-bandwidth Internet access and which can be done from home, abounds in Westfield: As of this writing, there were 4,654 data-entry WFH jobs listed on the LinkedIn professional website, a disproportionate number for the size of Westfield's population, as illustrated in the table below:

| Data entry work-from-home job openings on LinkedIn as of April 12, 2022 | Number of openings | City population |
|---|---|---|
| Hartford County, Connecticut | 4,640 | 899,498 |
| Boston, Massachusetts | 5,138 | 675,647 |
| Springfield, Massachusetts | 4,458 | 169,176 |
| Westfield, Massachusetts | 4,654 | 40,834 |

*Source: LinkedIn, April 12, 2020. See https://www.linkedin.com/jobs/search/?geoId=102380872&keywords=data%20entry%20work%20at%20home&location=Boston%2C%20Massachusetts%2C%20United%20States*

**VALUE ESTIMATE:** The potential value of the 4,654 data entry work-from-home jobs advertised on LinkedIn in April 2022 can be calculated as $72.5 million, given an average annual salary of $37,102.20 for each position[3] and applying a Whip City Fiber take rate of 42% to the number of jobs.

The ability to work from home has also affected the main job category in Westfield, namely "educational services, and healthcare and social assistance, which is one of the occupational categories for which a well-known study says at least 50% of work can be done at home, as illustrated in the chart below.[4] Given that this category accounts for one-third of all jobs in Westfield, or 6,159 jobs according to U.S. Census figures from 2020, even a fractional number of workers at home could represent a sizable amount of income for residents.




*Source: US Census data. *indicates occupations that can be done 50% at home based on information from Dingel and Neiman (see References).*

**VALUE ESTIMATE:** If we assume that even 1,000 workers in the educational services, and healthcare and social assistance category stay at home at least half the time, and if we apply a Whip City Fiber take rate of 42% to that figure and multiply by half of the average median annual income in Westfield ($74,456), we can estimate that more than $16 million can be attributed to the city's fiber broadband every year.

[3] This figure assumes an hourly wage of $17.84 for data entry clerks in Massachusetts as reported by employment site Indeed on April 12, 2020. See https://www.indeed.com/career/data-entry-clerk/salaries/MA

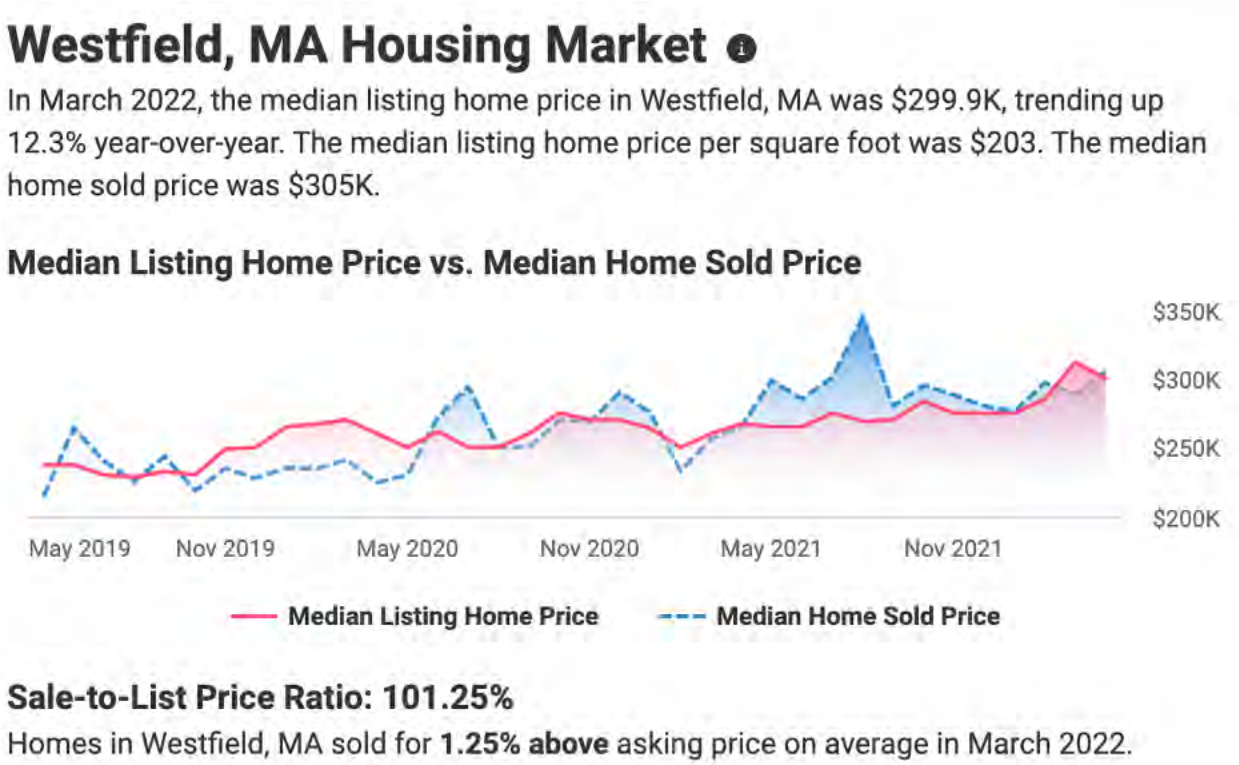
[4] Jonathan I. Dingel and Brent Neiman white paper, "How Many Jobs Can be Done at Home?" See References.

**Education**

The twelve public schools in Westfield, half of which are elementary schools, benefit from availability of fiber broadband. According to Stefan Czaporowski, superintendent of Westfield Public Schools, fiber makes it possible to support a district-issued Chromebook computer for each student. Previously, no local ISP could offer comparable performance to support this initiative. Pursuing its usual community-minded policy, WG&E went further by contributing $50,000 to the Chromebook effort. "They've been a great partner to us and we appreciate their assistance and generosity," Czaporowski said.

**Real Estate**

Home buyers are moving into Westfield, since fiber became available in the community. The median list price of homes, $299,900, represents growth of 12.3% year-over-year.[5] The general uptrend may be part of the overall housing market nationwide, but what is not universal is the increase in sales of properties above the asking price, as illustrated in the chart below:




*Source: Realtor.com, April 12, 2022; https://www.realtor.com/realestateandhomes-search/Westfield_MA/overview*

At least one realtor says fiber broadband has made homes in Westfield easier to sell. "I think there is a relationship there," said Kathy Burns, a realtor with Berkshire Hathaway in Westfield. She says it definitely helps when she can tell a prospective buyer that 1-Gb/s fiber broadband is available at less cost than similar offerings from the cable company.

[5] This information is taken from Realtor.com, accessed on April 12, 2022. See https://www.realtor.com/realestateandhomes-search/Westfield_MA/overview

(As of this writing, Whip City Fiber charges $69.95/month for residential gigabit fiber broadband; Comcast charges $79.00 for residential cable broadband at speeds up to 1,200 Mb/s.)

**Business**

Availability of fiber optic Internet has brought tangible business benefits to Westfield and the neighboring partner communities. Within Westfield, at least four sizable startups have opened since 2015. One of these, Reliable Energy Analytics LLC, a cybersecurity technology firm addressing the needs of energy companies, requires substantial Internet bandwidth – the kind only fiber can bring.

Richard Brooks, co-founder and lead software engineer at Reliable Energy Analytics, acknowledged that the Whip City Fiber service is a factor in choosing to keep his business in Westfield. “The service is very reliable and performance is excellent,” he said. What’s more, Brooks said he saves significant travel time by having meetings online. “My travel expenses used to reach $10,000 per month, [so there] is a clear savings from being able to use the fiber services. The high-performance service does indeed save money from not having to travel to onsite meetings and the audio/video quality is acceptable.”

**VALUE ESTIMATE:** Reliable Energy Analytics is hardly alone in relying on the Internet for meetings. If even one other business saves comparable travel expenses thanks to the fiber optic communications infrastructure, that represents $240,000 saved annually – and much more gained in revenue from these businesses staying local.

**Fiber Comes to Blandford**

Blandford, Mass., is a small town in the Berkshire Mountains roughly 12 miles northwest of Westfield. With a population of about 1,200 spread across an area of 53.4 square miles, it is chiefly a rural residential community, with just a post office and general store in the "downtown" area. Still, fiber here is extensive: The town's 52.8 miles of roadways are all equipped with fiber, and 88% of the homes there have Whip City Fiber Internet service.

Not long ago, Blandford was a kind of Internet desert, with Verizon DSL and satellite Internet the only options. It was impossible to download movies or use a smart TV. Efforts to get a fiber optic network had been discussed for several years before the town's selectmen heard about the Whip City Fiber projects and decided to participate.

"It was the best decision we ever made," said Peter Langmore, the town's Municipal Light Plant manager. Using a combination of state funds, federal Connect America Fund Phase II funding (obtained with help from Whip City Fiber), and a $1,750,000 municipal bond for a total of approximately $3 million, a committee of volunteers set to work planning the network with Whip City Fiber.

One challenge proved to be prepping the utility poles for the fiber. Each pole was already equipped with electric and phone wiring, all surveyed for positioning on the pole at specified distances. Now fiber optic cabling had to be fit between the electric and phone wiring at a distance measured by laser. This was the "make ready" stage, and it took months, given that there are 1,545 utility poles in Blandford.

Once the work was completed and the network went live in 2021, all difficulties were forgotten.

"I think that everybody is one hundred percent satisfied," said Langmore. "The network never goes down, and the only reason it would is if a tree fell down or something.
All of the hill towns have had positive experiences."There are several indicators of the benefits fiber brings to Blandford. One is the availability of telehealth, a vital service for the senior population. Another is that children and quarantined workers had access to high-speed services from home during the pandemic. Many residents continue to work from home.

Langmore also thinks fiber is a significant selling point for homes and businesses. "It helps to sell a property, especially when someone calls to ask, 'I'm thinking of buying land. Who do you have for Internet? We need broadband right away.'"

The answer used to be a dealbreaker; now it's a dealmaker.

The White Church at Blandford, Mass., a National Historic Register building. *Source: Peter Langmore*

**Conclusion**

Fiber broadband has been available in Westfield, Mass., for less than five years, but its impact on the community has been dramatic. More than 40% of local Internet subscribers have opted for the fiber service, displacing a formidable incumbent. And with the rise of work from home and remote learning, there has been no slowdown in network performance or availability. Employment in the area is taking off, as data entry opportunities abound. Fiber also has widened business prospects. And real estate in town has been gaining value, as affordable high-speed Internet has become a selling point.

Westfield's success has had far-reaching effects. Twenty nearby small towns in the Berkshire Mountains have been able to launch their own fiber networks with project management assistance from Whip City Fiber. These towns also are benefiting from Whip City Fiber's ISP services. Such a promising start bodes a bright future for the region.

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