



Town of Middlefield Communications Committee

Middlefield wireless/hybrid broadband FAQ

Q: What is broadband?

A: Broadband is high speed Internet access. In 2015, the Federal Communications Commission voted to raise its benchmark speed for broadband internet access from 4 to 25 megabits per second (Mbps) for downloads, and from 1 to 3 Mbps for uploads.¹ This is roughly 10 times the speed of our Verizon DSL service, and five times the speed of our Town Hall network, with its 13 secure computers, plus the library computers, auditorium computers and public Wi-Fi. It is enough to support simultaneous phone calls, text messaging, and web browsing, plus up to 5 HD video streams, video conferences, or two-way online games.²

Q: What is wireless broadband?

A: It's a way to deliver Internet access and telephone service using advanced radio technology. There are different wireless designs but they all have Access Points (APs) from which the signal is broadcast out to transceivers on customer premises. The town's APs will be on the transfer station tower, and on poles of varying heights as required, much like telephone poles.

Q: What is the Middlefield Municipal Light Plant?

A: Middlefield Town Meeting votes on May 7, 2011 & August 8, 2011 established the Middlefield Municipal Light Plant (MMLP) to create a last mile broadband network connecting Middlefield homes and businesses. The Town, acting through the MMLP, will own the infrastructure and contract with third parties to maintain and operate the network.

Q: Why was Middlefield the first last mile town selected by the Baker team?

A: After persistent lobbying for a low cost wireless alternative for Middlefield, the Massachusetts Broadband Institute (MBI) hired Fred Goldstein of the Interisle Consulting Group to study our options. We then secured a planning grant from the MBI to draw up a comprehensive budgetary design and cost estimate for a fixed wireless network. Thus, we were the only town to arrive at the May 10 2016 meeting with Governor Baker with a comprehensive and viable plan.

¹ FCC Finds U.S. Broadband Deployment Not Keeping Pace; Updates Broadband Speed Benchmark to 25Mbps/3 Mbps to Reflect Consumer Demand, Advances in Technology, (https://apps.fcc.gov/edocs_public/attachmatch/DOC-331760A1.pdf).

² FCC Broadband Speed Guide, (<https://www.fcc.gov/reports-research/guides/broadband-speed-guide>).

Q: What did you present to Governor Baker?

A: Our Committee Chair, Stephen Harris, told Governor Baker that Middlefield’s project will:

- Be a template for multiple towns,
- Be fully funded by state grants,
- Provide town-wide 25/3 Mbps service, and,
- Be a public-private partnership.³

Q: What is Middlefield’s share of last mile broadband funds?

A: Middlefield's share of the last mile broadband funds is \$580K, according to our town profile.⁴ As presented to Governor Baker – that’s more than enough to cover our entire project.

Q: When did Middlefield receive the first of the new broadband awards?

A: Middlefield had the honor of receiving the first of the new broadband awards for our wireless pilot in June 2016.⁵

Q: That was a year ago, why has little been done?

A: Primarily due to pressure from the MBI to wait for their promised solution which has yet to materialize. See, “Are there zoning issues concerning the Transfer Station tower?” and “Shouldn’t we wait for the MBI to line up providers to bring fiber to Middlefield?” below.

Q: Oh sure, but won’t the MBI only give us \$310K in “construction” funds?

A: Despite our presentation to Governor Baker, the MBI held that we would only get \$310K in “construction” funds, while \$270K, or 47% of our broadband grant, was to cover MBI’s “professional services.” Our Selectboard was told that “It’s not money that comes to the town, it doesn’t travel to the town, it’s the money that supports [Project Manager] Cornell [Robinson], supporting all the towns whether you’re doing fiber or wireless or however you’re doing.”⁶

But thanks to the region-wide campaign spearheaded by members of our Communications Committee,⁷ the MBI announced a “radical shift” in February 2017, that gives last mile towns

³ *Affordable Last Mile Wireless Broadband for Middlefield MA; Communications Committee Presentation to Governor Baker, May 10, 2016* (<http://middlefieldma.net/wp-content/uploads/comcom/lastmile/2016-05-10-middlefield-affordable-wireless-broadband.pdf>).

⁴ *MBI Last Mile Town Profiles, April 2016* (<http://middlefieldma.net/wp-content/uploads/comcom/lastmile/2016-04-23-mbi-unserved-town-profiles.pdf>).

⁵ *Commonwealth, Mass. Broadband Institute Announce Grant for Middlefield Wireless Pilot Project: First Award Made Under State’s New Flexible, Community-Based Approach to Advance Broadband Expansion in Underserved Communities, June 8, 2016* (<http://broadband.masstech.org/press-releases/commonwealth-mbi-announce-grant-middlefield-wireless-pilot-project>).

⁶ Presentation of Bill Ennen to the Middlefield Selectboard, October 28, 2016.

⁷ “Report’s author pleased to see Massachusetts Broadband Institute money freed up” (http://www.berkshireeagle.com/stories/reports-author-pleased-to-see-mbi-money-freed-up_501682).

ultimate control over **all** of their broadband funds, including the \$18M that MBI had been withholding for “professional services” (an additional \$270K for Middlefield).⁸

Q: So can the entire network be constructed at no cost to Middlefield taxpayers?

A: Yes, going from \$310K to \$580K is a game changer, since our current projected construction budget is \$483K.⁹

Q: What happens to any leftover funds at the conclusion of construction?

A: We are seeking to confirm that wireless towns could apply any last mile grant funds not expended during initial construction to capital depreciation. This would be of great help during the first five years as we ramp up to our full complement of subscribers.

Q: How can our town obtain its share of the funds?

A: The Baker-Polito Administration implemented a new Last Mile Infrastructure Grant Program that makes grants directly to rural communities “for the design, engineering, and construction of publicly-owned broadband networks.”¹⁰ The Executive Office of Housing and Economic Development (EOHED), not the MBI, administers the program. The Selectboard can apply to the EOHED at any time.¹¹

Q: Why is our network now a “hybrid” project, I thought it was all-wireless?

A: Since the total projected wireless costs for the entire town are well under \$580K, we should be able to spend an estimated \$40K to implement fiber in the business district, including the densely populated stretch of Skyline Trail, up to the town hall.

Q: What did the Communications Committee recommend to the Selectboard?

A: At our April 5, 2017 meeting we voted to recommend that:

- The town apply to implement the Hybrid Broadband Project in the attached budget which, at an estimated cost of \$483K, would entail no cost to Middlefield taxpayers.
- That the project be implemented in three phases:
 - An initial wireless pilot to provide engineering specs.
 - A wireless rollout to the entire town.
 - Fiber implementation in the town’s Business District, including Skyline Trail from 140 Skyline to the Town Hall.

⁸ “Massachusetts Broadband Institute expands options on last-mile broadband” (<http://berkshireeagle.com/stories/massachusetts-broadband-institutue-expands-options-on-last-mile-broadband,499714,499714/p/stories/digital-divide-broadband-in-the-berkshires,498160>).

⁹ *Middlefield Hybrid Broadband Project Costs* (<http://middlefieldma.net/wp-content/uploads/comcom/lastmile/2017-03-28-middlefield-project-budget.pdf>).

¹⁰ *Baker-Polito Administration Announces New Broadband Grant Program*, March 28, 2017 (<http://www.mass.gov/governor/press-office/press-releases/fy2017/administration-announces-new-broadband-grant-program.html>).

¹¹ <http://www.mass.gov/hed/community/funding/last-mile-infrastructure-grant-program.html>.

- That the town engage with Westfield Gas + Electric to implement the project on an MLP-to-MLP basis.¹²

Q: What infrastructure will the town deploy?

A: The wireless infrastructure will employ:

- A 90' tower at the transfer station.
- Approximately 11-14 wooden poles along town roads.
- Each pole will have 2-8 antennas.
- The Chester Fire Tower



Figure 1: Antennas on top of 50' pole in Royalston.

Q: Are there zoning issues concerning the Transfer Station tower?

A: That is a matter of contention. Both the Building Commissioner and Town Counsel say that the tower is permissible. As further clarification, we voted to send the following proposed amendment to the town’s Wireless Communications Facilities bylaw to the Planning Board:

Neither this section, nor the 3.1 Intensity Regulations (Dimensions) under Section III, General Use Regulations, shall apply to facilities owned by the Town or its Departments, including the Middlefield Municipal Light Plant, that are erected on town properties for the purpose of providing wireless broadband service.

The Selectboard was also given an application for a Zoning Board variance.

Q: Why does the current plan call for a guyed tower, rather than a monopole?

A: Cost is the principal consideration. Town Counsel insisted that the erection of the monopole was a “public construction project,” subject to prevailing wage, insurance, and other requirements that caused all but two potential bidders not to participate, and removed our ability to negotiate with the bidders or find our own subcontractors. The low bid put the cost of the concrete foundation alone at \$62K – far more than the entire estimated cost for a guyed tower.

The guyed tower would be subject to much simpler Chapter 30B procedures that apply to under-\$50K procurements. In addition, a guyed tower is far more stable – an important consideration when mounting microwave antennas.

¹² *Last Mile Broadband Recommendations* <http://middlefieldma.net/wp-content/uploads/comcom/lastmile/2017-04-05-broadband-recommendations.pdf>).



Figure 2: Mockup of proposed guyed communications tower.

Q: Why can't we run fiber to the entire town?

A: We can, but the MBI projects that we would have to come up with an additional \$1,010,000 in order to do so.¹³ Hybrid wireless/fiber is approximately one-third the cost to build and should cost slightly less to operate as we would only be licensing poles for the fiber in the business district.

Nothing about our proposal precludes fiber in the long term. Wireless can be up and running within the year, town-wide. Fiber usually takes at least two years to get built, once it's funded. So the wireless network provides residents with service, and allows them to sell their homes without the buyer being limited to satellite (DSL is grandfathered and no longer transferable to a new owner). In the unlikely event that fiber becomes available outside of our business district, the wireless network will be there until that gets built.

Q: What will the installation at a home or business entail?

A: A radio-antenna combination, typically resembling a satellite dish but smaller, will be mounted on the outside of the house, and a wire will be brought inside. The service is then usable via Ethernet or across the house via Wi-Fi.

¹³ *MBI Last Mile Town Profiles*, op.cit.



Figure 3: Typical CPE radio (Cambium Force 200).

Q: How much will service cost?

A: We're estimating that high-speed Internet service will cost about \$65 per month, and phone service \$25 per month. We'll have a better idea once the bids for the operator/service provider come in. The town could institute tiered pricing, for different levels of service.

Q: Is there a cap on the amount of data I can use, as there is with satellite service?

A: No.

Q: Can I keep my existing internet and/or phone service?

A: Yes, nobody is required to sign up.

Q: If I sign up later on, will I be penalized?

A: No. There is not a significant added cost to provide service to another location, so unlike most fiber plans, you can sign up at any time without incurring a late arrival penalty.

Q: What services will be offered?

A: The network will offer:

- Affordable Internet
- High quality phone service (unlike Vonage and other VoIP services that must compete with movies or video games).
- No Cable TV. Those who wish can keep their dish, or subscribe to Netflix, Sling, YouTube, etc.

Q: How will signals be carried to my home?

A: The network will employ a mix of radio frequencies to optimize performance to each home, depending on the terrain and extent of tree cover.

Q: Can I subscribe to a higher level of service?

A: Yes, if you are within line of sight of an AP on the transfer station tower or one of the poles, higher speed service will be available. As technology is continuously improving, chances are speeds offered will increase with time. So while we should be able to deliver 25 Mbps service to everyone, even higher speed service may be available in certain areas.

Q: According to project requirements of the MBI, we only have to cover 96% of the homes – who will we leave out?

A: Nobody. That's the MBI's minimum requirement – we plan to cover everyone who wants to subscribe – 100%.

Q: WiredWest says that wireless is “slow and ill-equipped for modern applications” and “subject to interference from weather and signal obstacles including foliage.” Is this true?

A: No. While a number of attempts to provide wireless in rural/wooded towns have failed in the past, wireless technology has evolved rapidly in recent years. Successful wireless projects in our region include Hilltown Networks, the Royalston Broadband Network, and Warwick Broadband. Unlike mobile wireless, fixed wireless is installed in place to MLP specifications.

As for weather, see “Wireless might be fine on a sunny day ...” below.

Q: If wireless works, why do we need a pilot?

A: The trial will be conducted at selected Middlefield locations in order to evaluate the real-world performance of the latest equipment in terms of coverage, effective speed, ease of deployment, and ability to penetrate foliage and other “clutter”. The results of the tests will then be used in the final calibration of our network design tools, so as to optimize the town-wide rollout.

We will put up a group of actual user links in order to calibrate our installation models and determine what types of radios work best on various types of paths. The heavy tree cover in many locations has a big impact on coverage, and it varies with the elevation above ground, with the seasons (it is worst in summer when leaves are out), and with the weather (wet leaves are worse than dry ones). Thus our pilot plan reaches about 30-40 selected locations that have different foliage and terrain profiles, and operate on different radio frequency bands, to see how they compare to forecasting models. It will also let us see how measured signal strength impacts actual performance (speed and sector capacity) for each type of radio. A simple drive-by test would not provide the same accuracy, as it would not account for clutter or monitor signal quality from utility-pole & tower-mounted APs over time, under varying loads and conditions.

Q: What are the benefits of using the Chester Fire Tower?

A: Access to the Chester fire tower would:

- Provide line of sight to dozens of homes, reducing the need for expensive TV White Space equipment and replacing at least two poles with their associated equipment, for about \$20K in net savings.
- Reach two poles on East River Road that would obviate the need for a half-mile fiber run past Glendale Falls (or a large monopole planted in granite near the environmentally-sensitive site), for a savings of \$25K.
- Facilitate backhaul between poles and towers. (See, “What is backhaul?” below.)
- Allow for the use of shorter poles on Chipman Road and Chester Road, saving approximately \$7K.
- Foster regional solutions via access to locations in North Chester & Worthington.

All told, access to the high location would save the town an estimated \$52K in construction costs, foster regional rationalization, and simplify the installation of town-wide high-quality access.

Q: What are the chances that we will be able to use the fire tower?

A: Very good, according to the MBI. They had let their access agreement with DCR expire, but say they are working to renew it. As they have yet to show any results, we may need to pursue other avenues.

Q: Will our network have to receive service through MBI's network – we heard that it's very expensive?

A: It had been a requirement that service had to be provided through the MassBroadband 123 network. That condition appears to have been dropped, so we are looking at alternatives. For example, our Transfer Station tower will have line-of-sight connectivity to the Access Plus tower near Washington Mountain, from which we can receive reliable service at a lower cost.

Q: Will we provide service to customers in other towns?

A: Yes. As radio waves don't respect town lines, we are looking to serve customers in the adjacent towns of Worthington, Chester, Peru, Washington, and especially Becket, who will not yet have access to broadband. We will also be able to provide commercial service to select locations as soon as the transfer station tower is up.

Q: Are we working with other towns?

A: Yes. Our Communications Committee has visited a number of towns and we are an active participant in the Hybrid-Wireless Working Group. We also have a member on the WiredWest board.

Q: What is "backhaul" service?

A: Backhaul refers to the connections between the pole that services the subscriber and the rest of the Internet. Within Middlefield, dedicated high-speed point-to-point links will provide backhaul to all of the poles, with some redundant paths to improve reliability. From there, service goes out via MassBroadband 123 or an alternative route, such as Access Plus, to the global network. For example, the Leverett network subscribes to 2 Gbps (2K megabits) of service, although the daily peak usage for all of their 640 customers combined is between 550 and 800 Mbps, or less than 1 Gbps.

Q: Wireless might be fine on a sunny day, but aren't rain, snow, and worse yet, ice going to degrade my service?

A: In general, no. The radio frequencies we will use are too low to suffer from meaningful rain fade. Snow does not impact radio reception. Under some unusual circumstances, ice may have a minor impact on service, but this is rare.

Q: What happens in a hurricane, when trees come crashing down?

A: Our tower will be engineered to withstand the strongest gusts anticipated here (110 MPH). If a tree crashes onto one of our poles, it may knock out an antenna or, under extreme circumstances, the pole. A repair crew will then be dispatched. Frankly, wireless fares much better under these circumstances than either fiber or old copper telephone lines, which can break when trees fall on them.

Q: Won't I lose service when the power goes out?

A: All of our tower and pole equipment will have battery backup. The equipment at your home can be configured with an uninterruptible power supply if necessary. For customers who use our service as their primary telephone service, we expect to make battery backup for the home available too.

Q: Does wireless have a future?

A: Yes. In fact, the big players are moving to wireless, even in urban areas:

- Google has stopped building Google Fiber, reorganized that division into Google Access, and is putting all of its effort into wireless builds.
- Verizon has stopped building FiOS (other than completing a few promised builds, and is being sued for not even doing that in New York City) and is putting its money into an urban wireless “densification” plan. They have permission from Boston to replace 400 lamp posts with new ones that have antennas on top, and while they told Boston they’d be putting in FiOS, they’re only doing fiber in part of the city. They told Wall Street (the folks you don’t lie to) that the plan is to use dense wireless instead, and only build fiber to the tower (or stealth street lamp).
- AT&T has stopped building U-verse (DSL) and mostly stopped GigaPower (scattered fiber to the home) and is now promoting its own wireless densification plan. This mostly uses pole-toppers atop electric poles, with millimeter wave backhaul between poles.

What fiber is still being built is either for wireless use or heavily subsidized (e.g., Vermont Tel).

Q: Shouldn't we wait for the MBI to line up providers to bring fiber to Middlefield?

A: It's going on nine years since the \$40 million Broadband Act was signed into law. Carolyn Kirk, Deputy Secretary for the EOHED, explained to the Berkshire Eagle that there are 10 to 15 underserved towns that might opt for grants to build their own, noting that it is critical to give those at risk of being orphaned by the cable companies a path forward. As she told the MBI Board, "How long are we going to ask these communities to wait, if we're only focused on private providers?"

Especially heartening is Governor Baker's recognition that "[t]here is no one-size-fits-all solution to the broadband gaps currently facing rural Massachusetts towns, so our administration is empowering communities to pursue the solutions that are most appropriate for them."¹⁴

Nevertheless, our Selectboard is being pressured not to spend any more on our wireless pilot because a better solution is in the wings. For example, at the beginning of March 2017 our Last Mile Liaison wrote to our Selectboard Chair:

The real purpose of this communication is to urge continuing efforts by Middlefield to refrain from incurring expenses against the remainder of the pilot award that MBI made to Middlefield. I think I'm within about 3 weeks of more fully understanding what this and other changes will mean for the very smallest of towns.¹⁵

Yet, to date, no providers that have offered to finance fiber or cable for Middlefield:

- Crocker has no special source of cheap capital, so in response to the MBI's Private Provider RFP, they wanted each customer in the 70% of homes they planned to serve to put up to \$2700 of "subscriber financing" (helpfully urging them to take out bank loans).¹⁶ A couple of years ago they had put together a compelling spreadsheet showing why they'd have to charge >\$100/month to serve Middlefield subscribers. Their numbers simply do not work, even with \$580K of subsidy. Their investment would have been well over \$5000/home, and there would be considerable operating expense, so they would not make a profit.
- Comcast is only negotiating for "edge outs" where they have adjacent networks, and the price is quite high -- well above the MBI offer. In Chester, they took the money for a small edge-out, but they are frankly pretty smart people and know exactly how much they're willing to invest (and it generally comes out in the \$4000/subscriber range). Since it would cost them >\$1M to serve maybe 150 homes in Middlefield, even with the subsidy, the numbers don't work out -- that's why they did not bid in January.
- While we recommend working with Westfield Gas + Electric, they are a fellow MLP that provides professional services at cost, and cannot finance construction in other towns.

Note: This document is a work in progress that will be updated as new questions arise.

¹⁴ *New Broadband Grant Program*, op. cit.

¹⁵ Email from "Ennen, William (SEA)" to David DiNicola, March 1, 2017.

¹⁶ *Crocker Communications Application to Massachusetts Technology Collaborative for Last Mile Grants to Provide Broadband Service to Un-served Towns in Western MA* (included in: <http://broadband.masstech.org/news-and-resources/procurements/rfp-last-mile-grants-provide-broadband-service-unserved-towns?#PPRFPRResponse>).