

Memorandum

To: Leelanau County Board of Commissioners
Cc: Matt Ansorge, Leelanau County Emergency Management Director
Greg Julian, Kasson Township Supervisor
From: Kasson Township Technical Advisory Committee:
Chuck Schaeffer, Chairman
Jim Anderson
Jerry Mansur
Jim Selby
Natalie Wilson
Date: October 12, 2021
Re: Maple City Tower Project

We, the members of the Kasson Township Technical Advisory Committee (TAC), are reaching out now because we know you are in the process of considering bids for the project to increase the height of the county-owned communications tower in Maple City.

It would be premature to award a contract for the Maple City tower project now

Important technical, financial, and aesthetic aspects of the project have not yet been fully considered by the Board of Commissioners (BOC) as part of the due-diligence process. In addition, because the county is actively working on infrastructure and broadband planning relating to American Rescue Plan (ARP) funds, it would be more appropriate to consider the Maple City tower project as part of the process already underway rather than having it “jump the line” at this time.

The TAC has followed the Maple City tower project in detail, from issuance of the Request for Proposal (RFP) in July through September 21 and October 5 BOC meetings, and conducted a substantial amount of research on the potential merits and drawbacks of the project. We have also reviewed in detail the results of the Rural Broadband Internet Survey presented at the BOC meeting on September 23.

From the limited discussion that has taken place at BOC meetings to date, there seems to be an assumption that a higher Maple City tower would lead to more reliable communications and better broadband service options in the county. But **“If we build it, they will come” is far from guaranteed.** In fact, technology trends and limitations,

along with government communications policy and funding preferences, create a strong case *against* using equipment placed above 199 feet for wireless services.

At the October 5 COB Executive Board meeting, there was discussion about postponing the proposal due date for the Government Center tower project until March 1, 2022, in order to collect and analyze geologic samples to determine the stability of soils at the proposed construction site. Because geologic conditions affect foundation construction requirements, prospective bidders told Mr. Ansorge that the soils study findings could affect project bids (and costs) by \$100,000 or more. It was noted that a March 1 proposal due date was unlikely to delay the project, because due to weather, Spring-Summer 2022 is the earliest construction could occur even if a contract were awarded now.

This indicates **there is no real downside to taking more time to consider the benefits and costs of the Maple City tower project.** Please consider postponing awarding a contract for the Maple City project at least until more is known about costs for the Government Center tower, attempts are renewed to site a tower in Glen Arbor (and perhaps other poorly-covered areas), and the costs and benefits of a 300-foot tower in Maple City have been considered among the other potential infrastructure and broadband investments under study and consideration. If at the end of that process the BOC decides that the Maple City tower project should proceed, construction could still proceed in 2022.

County leadership has not yet made the case for the project

The RFP for constructing a new 199-foot communications tower at Government Center was issued at the same time as the RFP for the Maple City tower project. The Leelanau County Capital Improvements Program (CIP) for 2022-2027 indicates that a new tower at the Government Center site will provide “more coverage, better emergency services, and also revenue (from private companies located on tower) to the county and 9-1-1 Emergency Services.” The CIP identifies a new tower in Glen Arbor as a desirable project “to improve the 800MHz radio footprint for first responders as well as State Police, DNR, and National Park Service. Improve cellular and internet capabilities.” A Glen Arbor tower would provide “Increased level of service to citizens, better response for 1st responders, increased radio and cellular coverage, increase of county’s assets and added revenue (private companies located on tower)”.

The tower projects at Government Center and Glen Arbor were also identified as priorities in the CIP for 2020-2025. In contrast, **adding a 100-foot extension to the Maple City tower was not contemplated in the 2020-2025 CIP, and its justification in the 2022-2027 CIP is limited to “tower was designed to be 300 ft originally, but only constructed to 199 ft.”**

Also of note, in discussing expansion of fixed wireless broadband in Leelanau County, the May 2020 report from the Leelanau Internet Futures Team (LIFT) identified the need for an additional tower in the western part of the county. There was no mention that a higher Maple City tower would be important to improving broadband coverage.

Under Federal Aviation Administration (FAA) rules, a tower higher than 199 feet requires lighting. No one wants to look at communications towers, but they are a necessary evil. A lighted 300-foot tower in Maple City would be a constant, unavoidable eyesore for residents and visitors who value the beauty of our countryside by day, and our dark skies by night. **A project that would have such a negative visual impact should not be undertaken unless the service benefits clearly outweigh both the monetary and aesthetic costs.**

It is doubtful that there would be enough income from commercial leases for placing equipment above 199 feet to pay for the ongoing maintenance costs over the life of the tower. Note that the maintenance costs for a 300-foot tower are substantially higher than for a 199-foot tower. A higher tower requires longer wire lines and more fasteners, and is subject to higher wind and ice loading. Just changing a lightbulb can easily cost north of \$10,000. **A 300-foot Maple City tower is far more likely to be a money-loser than a money-maker.**

It's too soon to commit ARP funds to specific projects

The proposed funding source for the Maple City tower project is another concern. Whereas the 2022-2027 CIP identifies the Tower Fund, Communications Capital Projects Fund, and EDA Grants as funding sources for the Government Center and Glen Arbor tower projects, it indicates that **the Maple City tower project would be paid for with American Rescue Plan (ARP) funds.** The U.S. Treasury Department has still not issued final rules for how those funds can be utilized, and whether the State of

Michigan will be matching local government expenditures for some or all types of ARP-funded projects is also unknown.

To proceed with the Maple City tower project now on the presumption that ARP funds would cover it, or to authorize it before other ARP project proposals are fully vetted, would be inconsistent with the county's ongoing careful and methodical approach to considering how best to spend those funds for the benefit of county residents. The county solicited citizen suggestions for ARP projects this summer that are still under review.

The county is in the middle of evaluating the results of the recently completed Rural Broadband Internet Survey and contemplating hiring a consultant to develop a county-wide high-speed broadband plan. **It is far from clear that increasing the height of the Maple City tower would be a component of a county-wide broadband plan, and several important reasons to think that it would not.**

A higher tower in Maple City won't solve wireless coverage gaps

Current and future communications technologies don't require or benefit from using high towers. Wireless coverage gaps in the county for the 800 MHz band used for public safety and emergency communications, and for frequencies used for cellular and wireless broadband service, can only be remedied with an additional tower (or towers). None of these towers would need to be higher than 199 feet, so they wouldn't trigger FAA lighting requirements.

Increasing the height of the Maple City tower is not a substitute or work-around for a Glen Arbor tower. A taller tower in Maple City cannot meet the needs for a Glen Arbor tower expressed in the CIPs and the LIFT. Despite the challenges, efforts to site a tower in the western part of the county should be redoubled, because that is the only truly effective way to meet communications challenges in that area, now and in the future.

Bandwidth is the key

The performance of an internet connection is measured by "bandwidth," which is the maximum amount of data (bits) that can be transmitted over an internet connection in

a given amount of time, expressed in megabits per second (Mbps). Less data must be transmitted to send an email or text message than to send a photo. Loading a web page requires less data transmission than streaming a standard-definition video, which requires less data transmission than a high-definition video. Interacting over the internet through, e.g, a video meeting or online gaming, requires both receiving data (downloading) and sending (uploading) it. **You don't experience noticeable delays, freezes, or lost connections if your internet connection has enough bandwidth. Few Leelanau County residents are so fortunate.** An occasional freeze-up or switch from high-definition to standard-definition video may be tolerable when you're just watching a movie for fun, but as seamless internet performance becomes increasingly critical for work and school and healthcare, too-low bandwidth is a big problem.

Enter the concept of "broadband," which is the amount of bandwidth considered adequate to effectively use the internet. As the more data-intensive uses of the internet become more prevalent and critical, increasingly high bandwidth connections are necessary to keep up. Technologies like DSL, which was a quantum leap up from dial-up back in the day, can no longer meet minimum standards. Yesterday's "broad" band is now too narrow. For example, on a Zoom meeting, if your video service drops out leaving only audio, it's because you have run into bandwidth ceiling. Two years ago, this was just a theoretical problem for most of us, but now Zoom meetings are common. **The trend toward ever-increasing bandwidth needs will continue.**

In 1996, the Federal Communications Commission (FCC) set the first broadband internet bandwidth minimum threshold standard at 0.2 megabits per second (Mbps) for both download and upload channels. In 2010, the minimum threshold increased to 4 Mbps download and 1 Mbps upload. The current FCC minimum threshold standard for broadband internet bandwidth, 25 Mbps download and 3 Mbps upload (25/3), was established in 2015. For many Leelanau County residents, 25/3 service would be a huge improvement. However, even that bandwidth would soon leave us behind again, because as the Rural Broadband Internet Survey correctly notes:

"There are reports that the FCC is going to raise the minimum threshold to 100 Mb/s download and 10 Mb/s upload (100/10) as the minimum threshold standard for Broadband Internet. If that happens, only Fiber, Cable and certain wireless technologies in optimum conditions will be considered true Broadband."

Wireless broadband is only a stop-gap

At present, few Leelanau County residents have access to cable internet, fewer still have fiber service, and many live in unserved areas where no provider yet has plans to extend wireline broadband service. This, of course, is where the towers come in.

The Rural Broadband Internet Survey report states that “there are situations where wireless technologies can fill the gaps more economically, at least for the short term.” The report included measurements of wireless signal strength for the various carriers across the county. **Wireless signal measurements demonstrated high variability and unpredictability because “that is just the nature of wireless technologies.”**

Wireless broadband also has capacity limits. Over-reliance on wireless broadband leads to clogged channels that result in slowed performance and dropped connections. **The more people who use wireless broadband, the more performance degrades for everyone.** This is why we experience more trouble with wireless service when the crowds of tourists are here in the summer. Weather can also wreak havoc with wireless connections.

Public investment in infrastructure to support wireless broadband picks winners and losers in an especially unfair manner. Hills and trees interfere with wireless signal strength, and for this reason some residents and businesses would never be able to get service regardless of tower mounting height. **At best, increasing the height of the Maple City tower would just shift who gets coverage, because for every site reached, another site is “overshot.”** The effect is most pronounced for the higher bandwidth wireless technologies needed to meet the future needs of our residents and businesses. **Only wireline connections can be planned to reach every resident and business, and deployed in a methodical, equitable manner.**

The Range-Bandwidth Tradeoff Argues against Maple City project

There is one technology that could possibly benefit from a high tower in Maple City, and that is broadband delivered using low frequency, long wavelength signals. The Rural Broadband Internet Survey report indicates that Agri-Valley has proposed a network for Leelanau County that would operate in two bands, one of which is a 600 megaHertz (mHz) long-wavelength, lower-bandwidth service referred to as Band 71,

and the other is the higher-frequency, shorter wavelength 3550-3650 MHz Citizens Broadband Radio Service (CBRS) band.

Long wavelengths can maintain integrity over long distances, and so their effective range can be expanded with equipment mounted on towers at heights above those desirable for the rest of the wireless broadband technologies, all of which use shorter wavelengths. **There is, however, a tradeoff between range and bandwidth capability.** Consider a simplified analogy to AM and FM radio, both broadcasting from the same location: You can receive the long-wavelength, lower-frequency (540 to 1700 kiloHertz, or 0.54 to 1.7 MHz) AM station broadcasts over a much larger distance, but it's in mono, so the sound quality isn't that great. The shorter-wavelength, higher-frequency (88 to 108 MHz) FM station broadcasts in stereo, but you have to be much closer to the transmitter to tune it in. It's okay to listen to the news over AM, but you'd definitely prefer to hear your favorite song on an FM station.

Low-frequency technologies have the lowest bandwidth capability among all wireless technologies. By laws of physics, and FCC licensing practices, long-wavelength technology will not be able to keep up with rising broadband speed thresholds, and so its long-term usefulness is limited.¹ Again referring to radio: AM still has value, but you wouldn't buy an AM-only radio. **Like AM radio, low-frequency broadband is a poor candidate for infrastructure investment.**

Technology developments since the Maple City tower was built have sharply decreased commercial demand for mounting communications equipment above 199 feet, and that trend is certain to continue.² Wireless carriers in the Leelanau County (e.g., ATT, T-Mobile, Verizon, and the discount carriers who sublease from them) all optimally use tower heights below 200 feet to offer service at mid-band frequencies and above. This means that **a mobile hot-spot from your cellular carrier will provide better broadband performance than equipment that uses a low-frequency band, whether or not the height of the Maple City tower is increased.**

¹ In addition, the channel sizes that the FCC licenses for the low frequencies are comparatively small, which limits data capacity and communication speed and leads to downgraded performance in times of heavy use. Higher frequencies use larger channel sizes that allow faster and more efficient transmission and reception of much larger amounts of data.

² Among other sources, see "Global Cell-Site Construction and Evolution Strategies" by ABI Research, a well-respected industry analyst firm.

If enhanced coverage area is the goal, even for low-frequency broadband, the better option is to deploy it on new towers in areas of the county where coverage is weak.

Additional towers would spread benefits across more carriers. The public would be better served because there would be more competition and choice among wireless services that are all better able to meet the higher bandwidth requirements than low-frequency broadband from the Maple City tower. In contrast, **increasing the height of the Maple City tower gives an advantage to a single company with a monopoly position** because Agri-Valley holds an exclusive licence to use the low-frequency Band 71 in Leelanau County.

It is doubtful that there would be enough increased income from commercial leases for placing equipment above 199 feet to pay for the ongoing maintenance costs over the life of the tower. Furthermore, note that the maintenance costs for a 300-foot tower are substantially higher than for a 199-foot tower. A higher tower requires longer wire lines and more fasteners, and is subject to higher wind and ice loading. Just changing a lightbulb can easily cost north of \$10,000. **A 300-foot Maple City tower is far more likely to be a money-loser than a money-maker.**

The Agri-Valley Network Plan

Agri-Valley's "predictive" coverage maps in the Rural Broadband Internet Survey clearly illustrate the trade-offs between range and speed. These trade-offs, in turn, explain why their network plan relies on multiple frequencies.³ The Rural Broadband Internet Survey doesn't specify the tower height used in their coverage area modeling, but for Band 71, predictive modeling based on placing equipment at 300 feet would be

³ Wireless service providers typically utilize multiple frequencies to deliver good performance. Smartphones and fixed-wireless receivers have multiple antennas tuned to different frequencies and automatically switch among them based on signal strength and performance needs. For example, T-Mobile's 5G service uses three sections of the spectrum: Band 71 (600 MHz) for low-band services like voice and texting, Band 41 (2,500 MHz) for mid-band web browsing and video streaming, and mmWave (above 30,000 MHz) service for fastest performance in some urban areas. Increasing tower height to extend the range of coverage for Band 71 could enhance performance only for the lower-bandwidth services. The more data-intensive applications like video streaming that use mid-band frequencies such as Band 41 and CBRS do not benefit from high tower placement.

expected to show a larger coverage area than placement at 199 feet.⁴ **However, any increased Band 71 coverage area from a 300-foot tower would be modest at best, and it is likely that coverage gains for some would be offset by coverage losses for others.**

Agri-Valley's coverage map for the lower-frequency Band 71 shows a wider coverage area than the map for the higher-frequency CBRS band. However, the higher-frequency CBRS band is better suited to meeting high-bandwidth communications needs and ever-increasing broadband thresholds than Band 71. **Importantly, like other higher-frequency, higher-bandwidth technologies, CBRS does not require (or benefit from) high towers to deliver optimum performance.**

Not knowing Agri-Valley's service deployment plans, installing equipment on the Maple City tower at a height exceeding 199 feet may not be desirable or necessary for their business plans. Agri-Valley is certainly aware that costs of installations and maintenance of equipment increase with increased tower mounting height. Their business decisions regarding what Band 71 equipment to install and how high to place it would certainly include consideration of installation and maintenance costs as well as the number of potential customers they can reach. The number of extra customers they could recruit would be a function of the number of additional potential customers they could reach, and the broadband service choices and pricing available from all service providers who operate in their service area. Placement of equipment higher than 199 feet in Maple City may not expand Agri-Valley's potential customer base enough to make it financially desirable to do so.

Even if Agri-Valley expresses interest in placing Band 71 equipment above 199 feet on the Maple City tower, the county would be wise to set conditions and secure guarantees before investing in increasing the tower height. As noted earlier, the Band 71 technology could possibly benefit from a tower position higher than 199 feet, and Agri-Valley holds the exclusive FCC license to use it. This means that **investment in a tower height increase to allow greater reach for Band 71 would in effect be a direct subsidy to the company that has a monopoly on offering the service. Should the county wish to proceed with the Maple City tower on this basis, to protect the**

⁴ It is unknown whether a predictive coverage map based on a 300-foot Maple City tower would show acceptable Band 71 signal strengths at the western edge of the county. But like the other predictive and actual wireless coverage maps in the report, the Agri-Valley maps show weak coverage there owing to lack of communications towers in the area.

public interests, before initiating construction the county should obtain a firm commitment from Agri-Valley to use the extra tower height to offer service at acceptable speeds and an affordable cost within a reasonable time frame, and to continue to offer that service for a specified minimum period of time. The agreement should extend for a long-enough term at a high-enough rate to cover the county's construction and maintenance costs, because no other company can make use of that frequency and that height while Agri-Valley holds an exclusive license. In addition, given their monopoly position, it would be appropriate to require that Agri-Valley offer broadband service at an affordable rate, like other companies benefitting from public investment in broadband infrastructure (e.g., RDOF funds) are required to do.

Wireless broadband Is not the answer for Kasson Township

The Kasson Township TAC was formed by our Planning Commission in 2020. Our mission is to research and advise the township leadership regarding options for extending broadband service to all of our residents and businesses.

The Rural Broadband Internet Survey results put numbers to Kasson Township's sad broadband plight: **Kasson Township has the unfortunate distinction of being the only township in the county that currently has more parcels, including our township hall, that are unserved by wireline broadband than are served, and that will continue to have more unserved than served parcels even after Charter finishes its service expansion under the Rural Digital Opportunity Fund (RDOF).** Kasson Township has the lowest number of households and owner-occupied housing units per square mile in the county.

The TAC is particularly sensitive to the issue of broadband service affordability, because Kasson Township has another unfortunate distinction, namely being the township with the highest proportion of Asset Limited, Income Constrained, Employed (ALICE) households in the county. The "Poverty in Paradise: Invisible Leelanau 2021" report presented at the BOC Executive Board meeting on May 11 noted that fully 52 percent of our households earn more than the federal poverty level but less than the basic cost of living in Leelanau county. In addition, the 2021 total taxable value of parcels in Kasson Township is second lowest in the county behind Solon Township, but lowest in taxable value per square mile.

The combination of limited assets and low density portends that Kasson Township will stay last in line for commercial investment in broadband expansion and service upgrades. **From a business investment point of view, Kasson Township looks like the worst bet in the county for broadband expansion.**

Our one potential advantage is the presence of the tower in Maple City, so naturally, that is the first option the TAC explored for expanding broadband coverage here. Ultimately, we determined that **the Maple City tower cannot be used to extend broadband service throughout Kasson Township.** It is not possible for signals carrying sufficient bandwidth for true broadband to cover all of our residents and businesses. **Wireline service is the only technology that can extend broadband to all of our residents and businesses.**

Invest in wireline broadband, not wireless

The “certain wireless technologies” identified in the Rural Broadband Internet Survey that could meet evolving broadband standards all utilize high frequency, short wavelength signals, and the “optimum conditions” require low, closely spaced towers because short wavelengths are susceptible to deflection, interference, and absorption over even moderate distances. To meet Gigabit (1,000 Mbps) bandwidth with wireless service, equipment needs to be placed on closely-spaced towers no higher than light poles. Some members of our community have voiced concerns about deployment of high-frequency 5G wireless because its safety has not been proven. Because of bandwidth limitations, **a 300-foot lighted tower in Maple City is not advantageous for broadband now, and will soon be as useless as the DSL internet over phone lines that many Leelanau County residents are stuck with today.**

The life cycle of a technology considers both the durability of the equipment providing the physical connection and the capability of the technology to meet increasing bandwidth demands over time. A technology with a long life cycle is sometimes referred to as “future-proof.” Consistent with widely held views in government and industry circles, the Rural Broadband Internet Survey report expressed the opinion that cabled (i.e., wireline) services provide the best and most reliable broadband service, with fiber becoming the most economical to build with the longest expected life cycle. A wireline connection is always the superior choice. In particular, **a fiber broadband connection is direct, durable, expandable, and safe.**

While the initial investment is high, fiber is universally regarded as the best investment over the long term. A current budgetary cost estimate for fully installed, ready to use fiber (i.e., “out the door pricing”) is in the range of \$70,000 per mile, and dropping. **Averaging (and paying for) that cost over time can make the investment a bargain in the long run.** Government programs have a preference for funding fiber projects because of fiber broadband’s long expected life cycle. In terms of public investment and time horizon, it may be useful to think of fiber service like buying a house. It’s reasonable to take out a 30-year mortgage on a house, because it will last at least that long and maintain its value over that period, and owning a house confers a certain financial and lifestyle stability.

The Rural Broadband Internet Survey identified several projects in progress throughout Leelanau County to expand access to wireline service, some of which are supported by the federal Rural Digital Opportunity Fund (RDOF). RDOF sets up a kind of public-private partnership to encourage private investment in extending broadband to unserved areas where it would otherwise be unprofitable to do so. However, it’s not full funding, and companies have to make a substantial investment of their own to build out new service. **Companies have a full 10 years to fulfill their RDOF commitments, meaning the same market forces that have kept companies from investing in broadband in Leelanau County so far will continue to be a problem over the next decade.** To those of us in Kasson Township, this is especially disheartening, especially because many areas here aren’t even covered by RDOF awards.

The uneven availability of cable and fiber service in Leelanau County now, and the way it will persist even as RDOF projects are completed, reflects the downsides of expecting private companies to solve our broadband problem. It’s hard to justify broadband investment to stockholders in areas where there aren’t enough potential customers per mile of cable to recover sunk costs, let alone make a profit. The equation may shift a little when the people to be served are willing and able to spend more to get better service, which explains a few of the current islands of good service some companies provide in the sea of mediocre offerings. But **only purposeful investment directed by local government can ensure that all Leelanau County residents and businesses get broadband service in a fair and timely manner.** Local government knows the problem areas and is most responsive to its citizens.

In Summary

A 300-foot tower in Maple City wasn't needed in the past, it's not needed now, and it certainly won't be needed in the future.

Increasing the height of the Maple City tower from 199 feet to 300 feet won't solve cellular communications problems in the county or meaningfully extend the availability of wireless broadband service. A 300-foot Maple City tower would require FAA lighting and ruin views day and night for far more people than could benefit from any communications or broadband services that might make use of the extra 101 feet. The wireless coverage problems within the county can only be fixed with an additional tower or towers, none of which would need to be tall enough to trigger FAA lighting requirements, because current and future high-bandwidth communications technologies don't require or benefit from using high towers. At the same time, there is a substantial risk that the tower could become an ongoing drain on the county budget because of high maintenance costs and, due to restrictive frequency licensing and technology trends, a limited and declining number of parties that would be interested in leasing space above 199 feet.

Thank you for taking the time to consider our viewpoints. **This is a very important matter to us because we care greatly about getting better internet service in Kasson Township and throughout Leelanau County while maintaining our beautiful views and dark skies.**

If we can provide any assistance to you as you move through your decision-making process, we would be happy to do so. If you have any questions or concerns that require additional research, we are at your service.

Respectfully,
Kasson Township Technical Advisory Committee