

Dane County, Wisconsin
Telecommunications Site Review
New Support Structure

CityScape
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August 21, 2018

Supervisor Mary Kolar
Chair, Dane County Zoning & Land Regulation Committee
Dane County Planning & Development
210 Martin Luther King Jr., Blvd
Madison, WI 53703

RE: Dane County / CUP #2437
Verizon Wireless / #269139 / Exchange Site

Dear Mr. Allen,

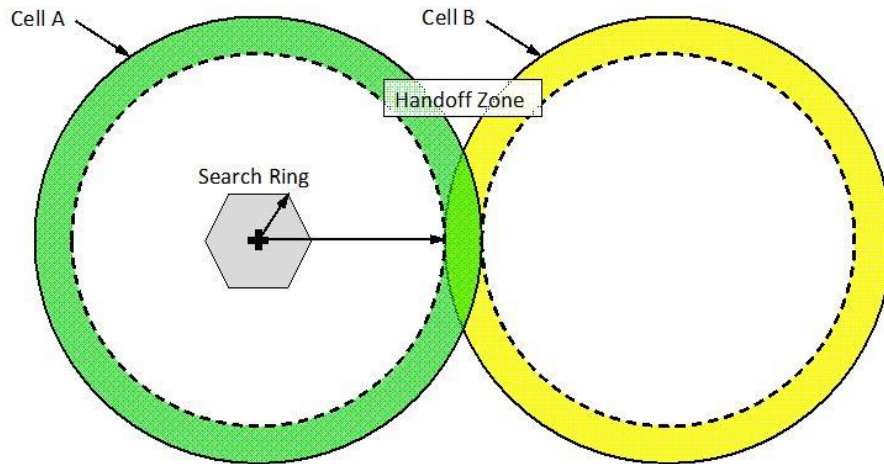
At your request, on behalf of Dane County, Wisconsin (“County”), CityScape Consultants, Inc. (“CityScape”) in its capacity as telecommunications consultant for the County, has considered the merits of the above referenced application submitted by Ton 80 Realty Services V, LLC on behalf of Verizon Wireless (“Applicant”), to construct a new wireless telecommunications support structure and associated ground compound at 2660 US Highway 51, McFarland, Wisconsin, *see Figures 1 & 2*. The proposed structure is less than 200 feet and does not require FAA approval or tower lighting.

Wireless Informational Tutorial

Cellular, PCS and EMSR wireless communications systems depend on the concept of resource re-use to achieve their network goals and objectives. With some technologies, the individual channel frequencies are reused every few cells, but not too closely, since interference would result. Wireless service is achieved through ground equipment and antennas mounted on towers, buildings or other elevated structures. The height and location of the elevated antenna platform is critical to provide sufficient wireless network coverage. Generally, the higher the antenna is mounted on the support structure, the farther the wireless signal penetrates a geographic area.

In the wireless system evolution, a provider would initially provide service with facilities spaced further apart with relatively tall antenna elevations to maximize the "footprint" at minimal cost. As the subscriber density increases, network capacity for these facilities increases, resulting in frequent busy signals or "no service" messages for end users. To remedy this situation, the antennas are mounted at lower heights to reduce the coverage area, thus reducing subscriber count per facility. When coverage areas are reduced, a new facility is needed to fill in the previously served area.

The Search Ring is a vital part of the submittal for any new personal wireless facility. The Ring identifies the optimum location for the facility and will control the operating parameters needed to meet the facility objectives. Of primary interest to a community are the location and the height of a structure all which is dictated by the Ring. Cellular search areas are usually circles of approximately one-quarter the radius of the proposed cell. In practice, it is simple to determine whether the search area radius is reasonable. The distance from the closest existing site is determined, halved, and a handoff "overlap" of about 20 percent is added. One fourth of this distance is the search area radius. This is illustrated below.



The hexagonal search ring radius is $\frac{1}{4}$ of the radius of the cell's coverage less a 20% handoff overlap

A reasonable search ring location is a key element in assuring that a site is justified. Generally, new wireless communication facilities are equally spaced with respect to existing sites. However, terrain, network capacity and other issues may necessitate a facility that it is *not* equally spaced with respect to existing sites. Typically, the wireless provider is asked to provide coverage prediction maps to indicate that a site is properly located.

An important part of any wireless communication facility application is the verification of the provider's proposed height requirements with generally accepted engineering. AT&T utilizes 700, 800 & 1900 MHz for voice communications and Advanced Wireless Service (AWS 1700/2100 MHz) for data within Dane County.

In addition to the minimum height and power needed for effective signal coverage, as more wireless devices are deployed, user capacity issues become the limiting factor. Technology is improving which allows towers to handle more devices, but it is not keeping up with the speed that such devices are connecting. As the industry heads for 5G in the next few years, more *localized* cellular sites will be needed. This will involve shorter towers that are closer together to limit their "reach". This practice has already begun in urbanized areas for the past few years and will continue in rural and urban residential areas. The future will also involve what are known as "small cells" which are antennas placed on street lamps, shorter buildings, etc. For these reasons the County can limit the height of the proposed structure and require it to be concealed *or stealth*.

This application is proposed to provide improved service along Highway 51 and areas of McFarland where existing Verizon service is unreliable. The proposal has been evaluated from the following perspectives:

- The proposed facility, as specified, is justified due to technological reasons and is essential for the Applicant to provide its telecommunications service; and,
- The proposed facility will follow the guidelines of the Telecommunications Act of 1996, the Dane County Ordinance and all other pertinent rules and regulations.

Dane County Ordinance Requirements

§10.194(1): CUP required

§10.194(2) CUP requirements:

- a. No existing towers exist within search area: none exist
- b. Any existing towers are of sufficient height: none exist
- c. Any existing towers are of sufficient structural strength: none exist
- d. **No electromagnetic interference will occur: need compliance statement**
- e. Collocation fees are unreasonable: Not Applicable
- f. Other factors deem existing tower(s) unsuitable: Not Applicable

§10.194(3): Term *reasonable* defined as 25% cost of new tower – Not Applicable

§10.194(4): Third party review – CityScape

§10.194(5): If less than 150 feet is proposed, tower must be capable of future increase to 150 feet and 2 collocations: Proposed tower is 130 feet with proposed extension to 160 feet

§10.194(6): CUP required for substantial modification: Not Applicable

§10.194(7): CUP condition requirements can be checked at later date – *defer to County*

§10.194(8): CUP not required for collocations that are non-substantial

§10.194(9): Equipment building limits: complies

§10.194(10): Unused equipment shall be removed – Not Applicable

§10.194(11): Future buildout plans may be required – Not Applicable

Additional CUP requirements for communication towers

- A. Legal Statement: provided in CDs
 - B. Tax Parcel number(s): provided in CDs and on CTIF
 - C. Completed Zoning Application Form: provided
 - D. Completed Communication Tower Information Form (CTIF): provided
 - E. Written Statement: Provided
 - F. Site Plan, Design Elevations, Site Photos and Photo Simulations: provided
 - G. CUP filing fee: *defer to County*
 - H. RF Engineering Analysis: materials from RF engineer and coverage maps provided
-

Site Justification and Coverage

The Applicant proposes to construct a new one hundred thirty (130) foot *monopole* tower (138 feet to top of lightning rod) with future extension capability to one hundred sixty and a half (160.5) feet (169 feet to top of lightning rod), *see Appendix, Exhibit A*. The extension is proposed to satisfy the Ordinance requirement of 150 feet for new towers.

The proposed site is within the Applicant's Search Ring. The Applicant's RF engineer has stated there are no existing structures within this ring. CityScape notes that there is an AM array (group of six towers) just outside the ring to the northwest. Collocating on an AM tower can be problematic and is not recommended, so we did not pursue this AM site further.

Tower Height Considerations:

The Ordinance specifies that, "...the committee shall, unless it is shown to be unreasonable, condition the grant of the permit upon the applicant placing or constructing the communication tower so as to accommodate, at a minimum height of 150 feet, the collocation of two additional antenna arrays similar in size and function to that placed on the tower by the applicant." The Applicant is proposing an initial height of 130 feet with a future extension that will permit two (2) future collocations at 150 feet and 160 feet. There would also be room for a third collocation at 140 feet (above Verizon), but the tower may need structural modifications since the proposed design does not include this fourth array. CityScape finds that the proposed height is justified and that the proposed tower meets the collocation requirement.

Landscaping/Screening:

The Ordinance does not require any landscaping or screening, just that the Applicant indicate if they volunteer to provide landscaping. The applicant is not proposing any plantings. The western portion of the compound is the only side visible from Highway 51. The remaining three sides have existing trees vegetation near the compound, which is set back from the road by

more than 500 feet. There is an existing barn and chain-link fence between the proposed tower and the road. For these reasons, landscaping does not appear to be beneficial in this case, though the final determination on requiring landscaping or screening is an issue best determined by the local authorities.

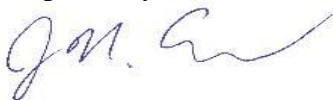
Conclusion:

The Applicant has demonstrated the need for a new 130.5-foot tower within its Search Ring, as indicated by the Verizon engineer's statement and coverage maps. CityScape Consultants, as the wireless expert for the County, recommends this Application for a new 130.5-foot tower be approved with the following conditions:

1. All feed lines shall be installed within the support structure and antenna ports shall be sealed in a manner to prevent access by birds and any other wildlife; and,
2. Proposed tower shall be galvanized and not painted any other color without approval of the City; and,
3. Applicant shall not begin construction until Federal SHPO/NEPA requirements are met
4. Prior to permitting, Applicant shall provide (on Verizon or SBA letterhead) a statement of compliance with the FCC's rules on RF exposure and interference to other sources

I certify that to the best of my knowledge all the information included herein is accurate at the time of this report. CityScape only consults for public entities and has unbiased opinions. All recommendations are based on technical merits without prejudice per prevailing laws and codes.

Respectfully submitted,



Jonathan N. Edwards, P.E.
CityScape Consultants, Inc.

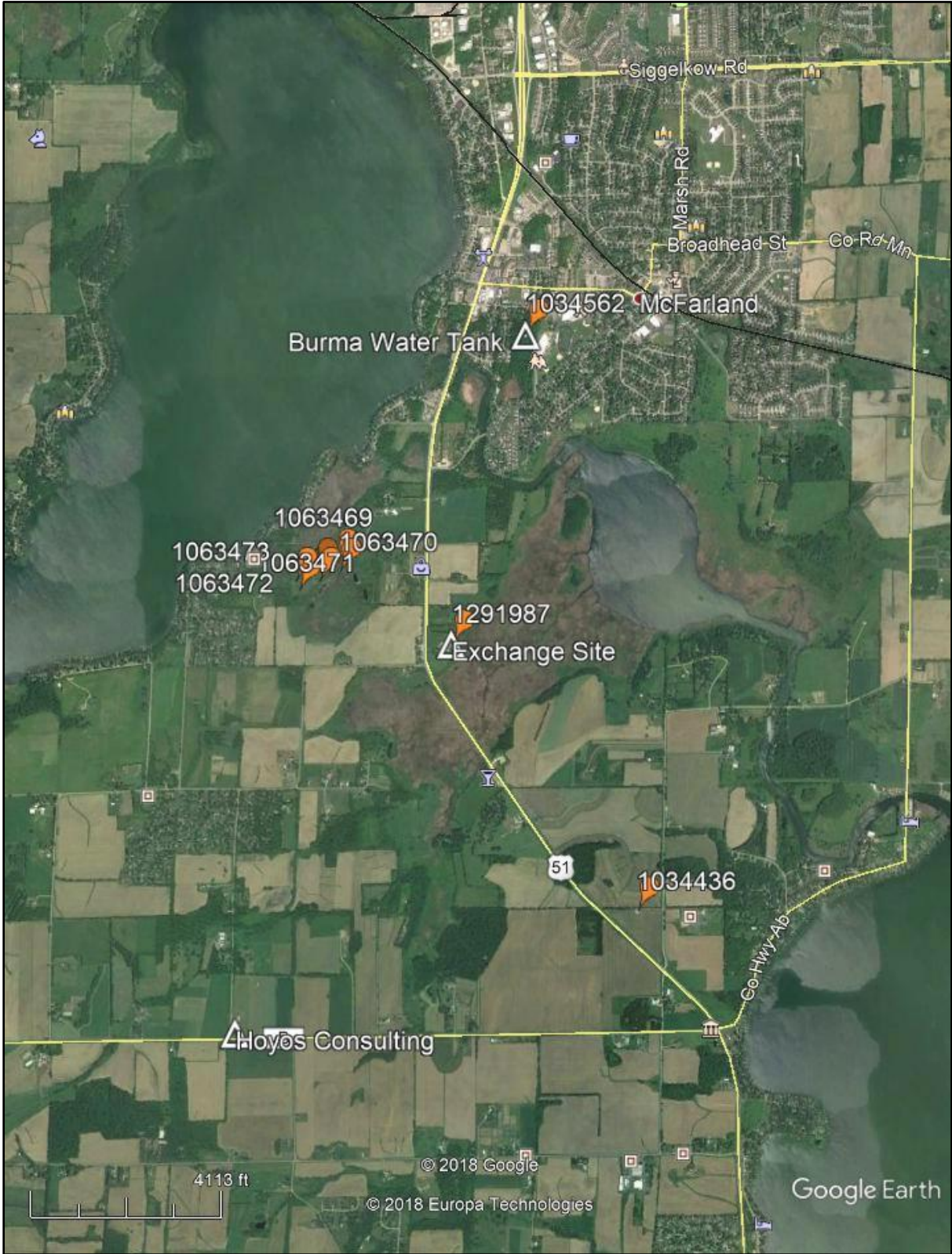


Figure 2 – Aerial Site View

Appendix

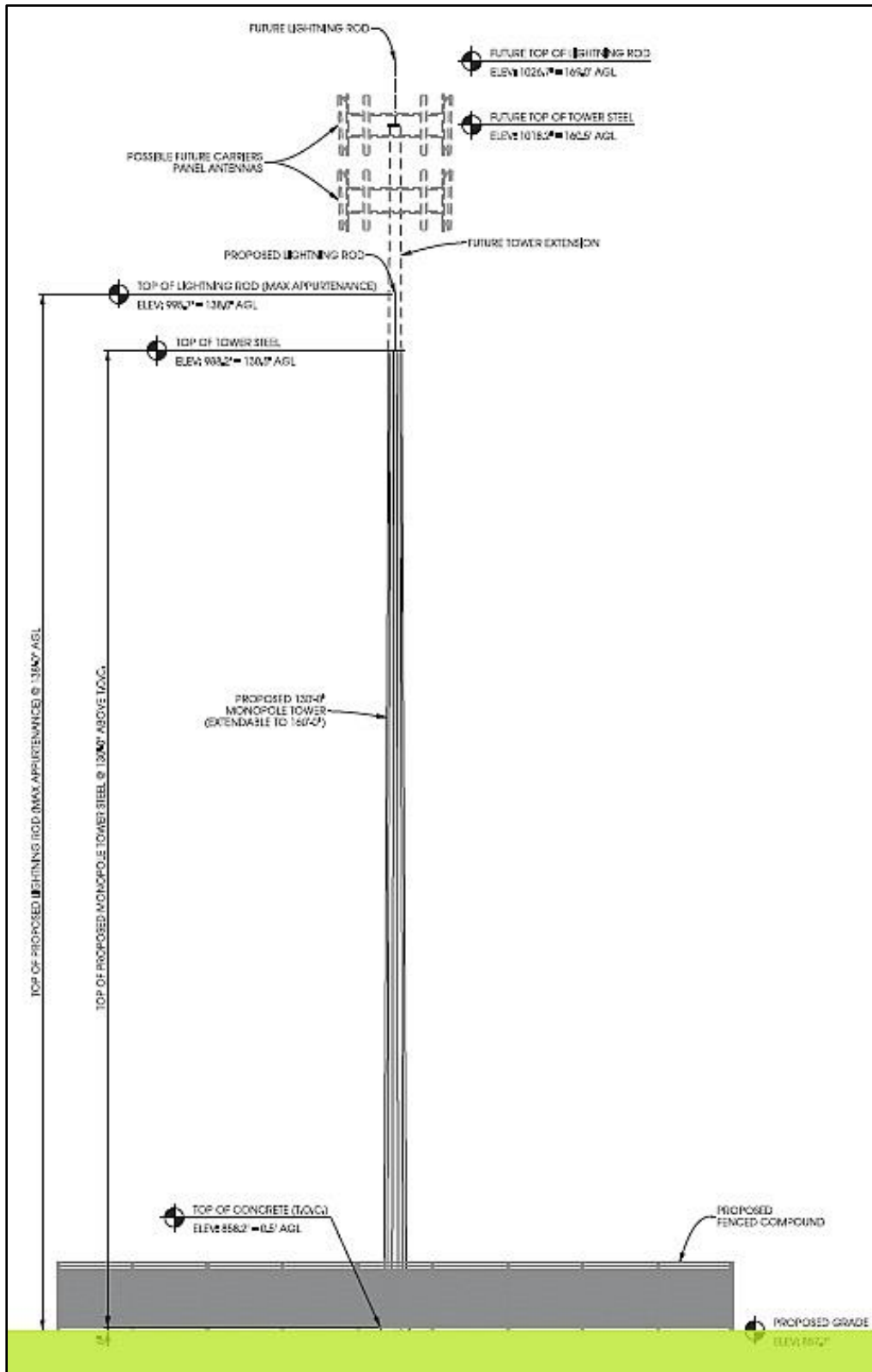


Exhibit A - Proposed Support Structure

