



**Engineering Statement**  
**Prepared for the County of Dane, Wisconsin**

**Proposed Verizon Wireless Location #185952**  
**Site Name: Hwy 51 & Pleasant Hill**  
**Municipality: Town of Dunkirk, Wisconsin**

**Review of Application for CUP**

**August 8, 2016**

**Prepared by:**

**Evans Engineering Solutions**  
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**I. BACKGROUND**

This engineering report has been prepared by B. Benjamin Evans of Evans Engineering Solutions, a Communications Consulting firm in Thiensville, Wisconsin, regarding a proposed Verizon Wireless 155-foot monopole antenna structure (extendable to 190 feet) to be located at the northeast corner of the intersection of US Highway 51 and Pleasant Hill Road, Town of Dunkirk, Wisconsin.

Evans Engineering Solutions has been retained to evaluate Verizon's proposal from the standpoint of radio-frequency (RF) engineering and coverage necessity. Pursuant to our employment, this statement has been prepared.

The siting information provided to Evans Engineering Solutions by Verizon Wireless has been used in evaluating the appropriate information with respect to Dane County's Communications Tower Ordinance and Wisconsin State Statute 66.0404 where applicable. The analysis and the conclusions contained herein have been prepared by or under the direction of B. Benjamin Evans of Evans Engineering Solutions, or have been submitted by the applicant. Information provided to Evans Engineering Solutions by other parties is believed to be correct, and has been verified where feasible.

**II. ABSTRACT**

Verizon Wireless is in the process of building up its LTE voice and high speed data network in the southeast area of Dane County. The need for a new site is normally self-evident when cellular coverage and call-handling capacity is lacking in an area of substantial population. As cellular phone users increasingly rely on their mobile devices not only for voice communications, but for essentially running electronic office operations, high-penetration levels on the cellular frequencies become mandatory. In addition, E-911 cellular traffic also places an additional load on the cellular network infrastructure. In order to improve coverage and capacity,



some new construction is to be expected. Federal regulations require that local communities treat all carriers identically with respect to permitting.

On the other hand, public safety, land use and other considerations must be addressed at the local level. Accordingly, the proposed site has been analyzed carefully from the standpoints of regulatory history and service necessity. The conclusions reached herein represent the most complete engineering evaluation we are able to perform. This document and the attached exhibits are true and accurate to the best knowledge and belief of Evans Engineering Solutions.

### **III. SITE ANALYSIS**

The following paragraphs represent our analysis of the instant Verizon Wireless application for a base station antenna site at US Highway 51 and Pleasant Hill Road, which was conceived out of a need to provide service to an area presently unserved or underserved by the existing Verizon Wireless base station network.

#### **#1 Antenna Structure Proposed by Verizon**

The tower proposed by Verizon Wireless will be initially built to a height of 155 feet AGL. A tower of this height has been requested by Verizon in order to fill a service gap and provide additional mobile and suburban coverage generally along US Highway 51, east of Stoughton. The Verizon Wireless antennas will be mounted on the proposed monopole tower at 150 feet. According to the engineering information provided, the proposed monopole will have the ability to be increased in height to 190 feet by adding a 35-foot monopole section. This tower height, according to Verizon, will ensure suitability for three future additional co-locator carriers' antennas at approximately 160, 170 and 185 feet, thus meeting the co-location requirements of the County Ordinance.

The tower diagram submitted by Verizon, and showing all pertinent features of the structure, is attached as Figure 1. Verizon will utilize a three-sector antenna array (six total antennas), representing full omnidirectional coverage.



## **#2 Network Propagation Analysis**

A propagation study conducted by Verizon Wireless, which was examined by this consultant, shows that the area in question is significantly underserved. This coverage gap, if not addressed, frequently results in reduced quality, dropped calls and no internet connection in this area. A cellular network must be put together like pieces of a puzzle; each site is strategically located so that when the network is completed, a wireless subscriber can use his or her mobile device anywhere in the area without dropped connections.

## **#3 Alternative Sites**

Wisconsin State Statute 66.0404, Paragraph (4)(p) prohibits a political subdivision from disapproving a building permit for a mobile service tower based on the availability of other locations, including existing structures, for the applicant's proposed activities. Thus, no discussion of alternative sites will be presented in this review. In any case, it can be confirmed that there are no federally-registered communication towers within 1.5 miles of the construction site proposed by Verizon.

## **#4 Proposed Antenna Array Height**

The cellular base station antenna height is dictated by the antenna height necessary for reliable coverage, which is influenced by topography and "look angle." Mounting the antennas 100 feet or lower above ground can cause the cellular base station signals to be degraded by hills and mature trees, which leads to cell phone call dropouts. This proposal appears to be reasonable at 150 feet above ground level, considering that Verizon Wireless intends to enhance service in a wide area.

## **#5 RF Exposure**

Although local governments are preempted by the federal Telecommunications Act of 1996 from regulating RF emissions from wireless base station sites, nonetheless exposure to RF signals is generally a concern to some local government officials and residents.

Exposure to RF signals from transmitting antennas is regulated by the Federal Communications Commission. The FCC standards, which were adopted by that agency in 1997, are based on RF exposure limits developed by the Institute of Electrical and Electronics Engineers, Inc. (IEEE) and adopted by the American National Standards Institute (ANSI) in ANSI/IEEE C95.1-1992, "Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz." At the time the ANSI/IEEE C95.1-1992 standards were being formulated, of



the 125 people that served on the IEEE committee, 90 came from academic or government research. Only 16 came from the communications industry.

In 1999, the Environmental Protection Agency expressed the view that “the FCC [RF] exposure guidelines adequately protect the public from all scientifically established harms that may result from RF energy fields generated by FCC licensees.”

The FCC standards specify a maximum permissible exposure (MPE) level for “uncontrolled” situations that apply in cases that affect the general public, such as cell towers near schools and/or residences. The FCC’s Office of Engineering and Technology issued a technical bulletin, OET Bulletin 65, entitled “Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields” for use in determining whether FCC-licensed transmitting facilities comply with the MPE levels adopted by the FCC in 1997. All FCC licensees, which include wireless providers, are required to adhere to these standards.

The proposed site will meet FCC RF exposure requirements with respect to the general population as long as industry standard practices are followed. Cellular antennas direct 90% or more of the total RF energy produced in a narrow beam towards the horizon rather than towards the ground below the antennas. Thus, RF exposure at ground level in areas in the immediate vicinity would be a small fraction of that which would be observed at 150 feet or more above ground near the tower.

Accordingly, with the RF energy exposure standards utilized in hundreds of evaluations by this consultant, and as per previous concurring opinions from the Medical College of Wisconsin<sup>1</sup>, there is no credible scientific evidence to suggest any public health risks related to RF emissions from cell towers.

## **#6 Safety Concerns**

The tower structure itself, if properly manufactured and installed, is extremely strong. Credible scenarios leading to a tower “falling over” are extremely rare. However, in order to address any remaining concerns, it is suggested that a Wisconsin Registered Professional Engineer not only approve the tower design (which should take into account accommodation for antenna arrays of three additional carriers), but inspect it after it is installed.

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<sup>1</sup> Moulder, John. "Mobile Phone (Cell Phone) Base Stations and Human Health." Medical College of Wisconsin. Version 8.0. N.p., 3 Apr. 2005. Web. 24 July 2013.  
<<http://www.mcw.edu/radiationoncology/ourdepartment/radiationbiology/Mobile-Phone-Cell-Phone-Base-S.htm>>.



### **#7 Co-location Capabilities**

According to Verizon Wireless, the proposed tower has been designed to accommodate three future additional carriers for a total of four carriers. Verizon Wireless has stated that it will allow future cellular antenna arrays to be added above 155 feet by expanding the height of the monopole by 35 feet. The intent of the co-location provision of the Tower Ordinance is to encourage other wireless carriers to locate their antennas on the approved tower so as to minimize the need to construct new tall towers. Since there are several cellular and PCS providers besides Verizon Wireless, additional providers could be expected to consider co-locating at this proposed site (although this is not guaranteed) because of an apparent lack of co-location candidates in the area. However, the technical requirements of other providers cannot be known by Verizon or this consultant.

### **#8 Conformance to Aviation and Industry Standards**

Verizon Wireless has filed a notice of proposed construction with the Federal Aviation Administration and has received a Determination of No Hazard from that agency for an overall antenna structure height of 195 feet above ground level (the expansion height to accommodate collocations). The FAA does not require that the proposed antenna structure be painted and/or lighted.

Assuming no serious malfunction of either cellular transmitters or public safety radio receivers, interference to public safety or other RF services is not expected. In any case, all transmitters and receivers located at common sites should observe good engineering practice with respect to tower bonding and grounding.

### **#9 Concerns of Interference to Receivers or Other Electronic Devices**

RF emissions from cellular base station towers have not been reported to cause interference to radio receivers, television sets, phones (wired or wireless), or other consumer electronic devices, in violation of FCC rules. Unlicensed devices, such as garage door openers and some wireless devices, are legally not protected from interference by FCC rules. However, even in these cases, interference is extremely rare because the emitted RF power used by the cell site is relatively low. Therefore, interference to consumer devices is not expected; even if it occurs, it can easily be mitigated by means of RF “choking” devices.



## **#10 Visual Impact**

A visual assessment is not included in the scope of this consultant's work with respect to this project. Verizon Wireless states that the visual impact of the monopole will be minimal, and site photos have been included with the application. The antenna transmission lines will be hidden inside the monopole. The FAA does not require the tower to be lighted or painted, so the monopole tower could be left with a galvanized metallic finish that would blend in with the sky, thus further reducing visual impact.

## **IV. CONCLUSIONS & RECOMMENDATIONS**

This consultant recommends approval of the cellular base station antenna structure as proposed. Verizon Wireless has sufficiently demonstrated a need for a new tower at the requested site to deliver mobile communications to an area presently unserved or underserved. It is the opinion of this consultant that the proposed tower will accommodate the communication needs of residents and businesses while protecting the public health, safety and general welfare, with respect to those items for which Evans Engineering Solutions is expert. The proposal tower will also be designed to prevent tower proliferation in the future.

Assuming that a qualified contractor performs the installation, no RF interference is expected that would be the subject of local jurisdiction.

This consultant further concludes and recommends the following:

- The RF emissions exposure level in areas accessible to the public due to the proposed Verizon antennas, even under worst-case assumptions, would be a very small fraction of the FCC maximum public exposure standard.
- As long as the installation is performed by a qualified contractor using proper electrical grounding methods, no RF interference is expected to occur in consumer communications devices or to public safety communications.
- A Wisconsin-licensed Structural Engineer should approve and stamp the tower design, and certify that the tower can support three additional cellular/PCS antenna arrays with a monopole extension. The finished structure should also be inspected by the Structural Engineer.



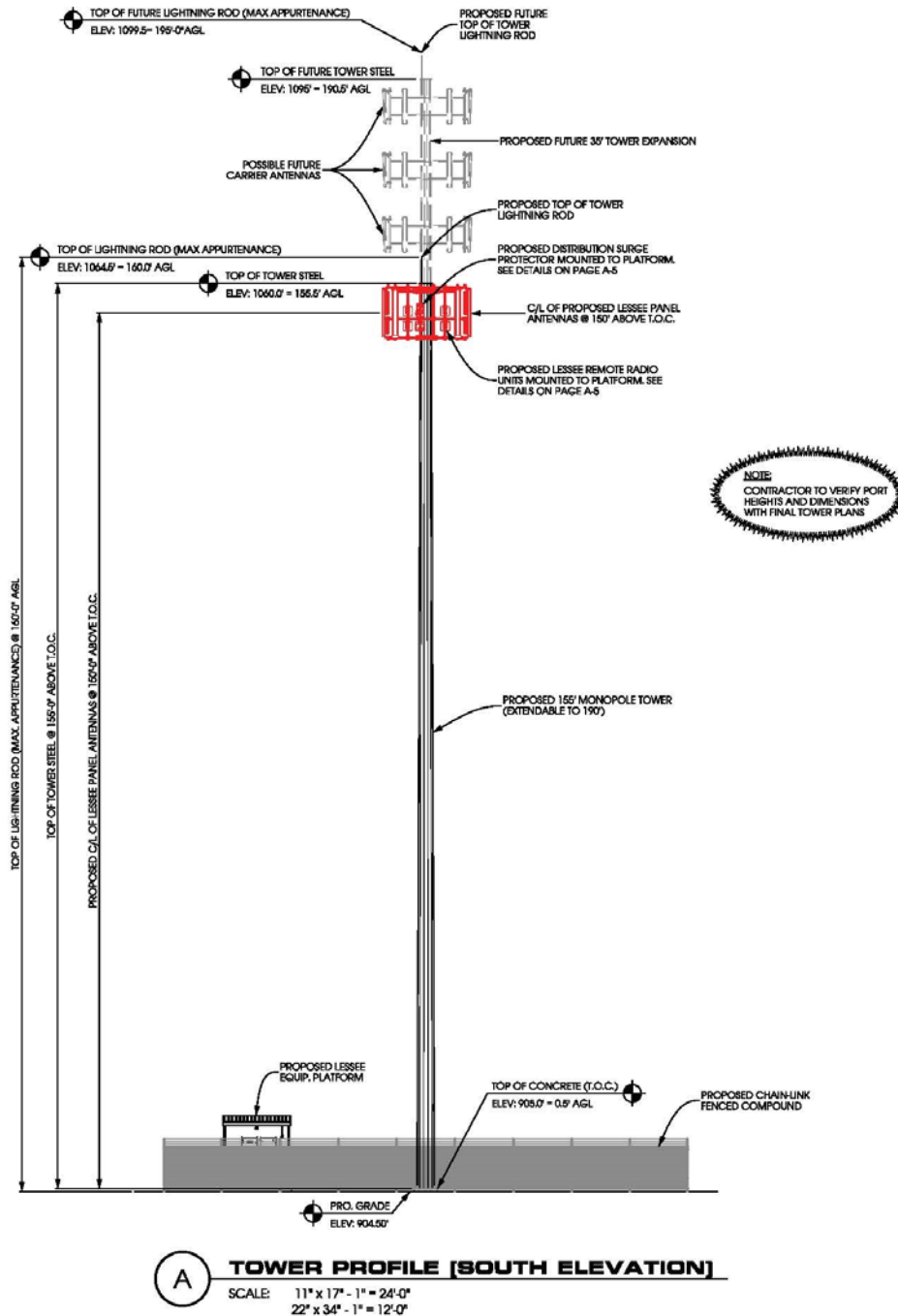
Respectfully submitted,

A handwritten signature in black ink, appearing to read "B. Benjamin Evans".

B. Benjamin Evans  
Communications Consultant  
Evans Engineering Solutions

August 8, 2016





**Figure 5 – Vertical Elevation Tower Drawing**