



August 9, 2019

Mr. David Storer City of Sonoma, Planning Dept. No. 1 the Plaza Sonoma, CA

RE: Verizon Wireless Small Cell Sonoma 006, 007, and 012 - Final Design Zoning Submittal Package

Dear David:

On behalf of Verizon Wireless, this letter provides information and an enhanced description to support the applications request to receive Design Review Approval to install a wireless telecommiunications small cell node in the public right-of-way for Sonoma 006, 007 and 012.

The following is a detailed **Project Description** of the facility designs, the project's purpose, and justifications to find support of the application.

#### Project Purpose:

The purpose of this project is to provide improved wireless voice and data coverage to the surrounding area. These wireless services include mobile telephone, wireless broadband, emergency 911, data transfers, electronic mail, Internet, web browising, wireless applications, wireless mapping, and video streaming. Further radio frequency details are set forth in the attached revised EME Reports, including construction drawings and photosimulations for each project referenced above.

A small cell consists of a radio access node connected to small telecommunications antennas(s), typically mounted on a utility pole within the public right-of-way. Its purpose is to distribute wireless telecommunications signals. Small cells provide telecommunications transmission infrastructure for use by wireless service providers.

Our proposal application will greatly benefit these areas by improving wireless telecommunications services as further detailed below.

#### Locations:

<u>Sonoma 006:</u> Verizon Wireless is proposing to install a small cell near 574-552 5<sup>th</sup> Street West. This location was chosen due to high traffic in the area and there was no other street light pole close by. This location also offers additional safety for the residents providing lighting.

<u>Sonoma 007:</u> Verizon Wireless is proposing to install a small cell near 303 W. Napa Street. This location was chosen due to no other street light pole close by and offering additional safety.

<u>Sonoma 012:</u> Verizon Wireless is proposing to install a small cell near 25 McDonell Street. This location was chosen due it being located in the Commercial District and having no impact to the Plaza Retail Overlay District and to creating more safety with lighting and coverage.

#### Scope of Work:

- Install (N) Commscope metro cell integrated pole at ground level.
- Install (N) canister antenna on (N) pole.
- Install (N) FFC signage on (N) pole.
- Install (1)(N) RRU inside pole base module.
- Install (1)(N) disconnect switch inside pole base module.
- Install (1)(N) PG&E Smart Meter inside pole concealment module.

#### Additional Comments:

Pursuant to the Design Alternative Workshop on July 17, 2019 and your request for us to work with a design that is more condusive to the existing street light poles, please find for your review our submittal packages for Sonoma 006, 007 and 012. CBR has taken into account your feedback in creating a design that resembles Sonoma's exiting light pole theme. The design features coupled with their locations will provide for better Verizon Wireless service in Sonoma and help to better support residents, visitors and emergency service providers who rely on the Verizon Network.

Please find in this package the following:

- 1. Project Description Letter
- 2. Sonoma 006 Construction drawings
- 3. Sonoma 006 Revised photos sims
- 4. Sonoma 006 Revised EME reports
- 5. Sonoma 007 Construction drawings
- 6. Sonoma 007 Revised photos sims
- 7. Sonoma 007 Revised EME reports
- 8. Sonoma 012 Construction drawings
- 9. Sonoma 012 Revised photos sims
- 10. Sonoma 012 Revised EME reports
- 11. Sonoma 012 Site Photo PROD map

After collarborating with Sonoma's Planning Director, along with feedback from Planning Commissioners from two Hearings, CBR and Verizon developed a design that takes into consideration Sonoma's existing historic decorative lights that are located throughtout the Town Square.

CBR created a design that is most suitable current surrounding while preserving Sonoma's historical vision that has least visual impact while providing the much needed service to the community for Verizon customers, visitors and the emergency service providers who rely on their service.

We look forward to your review and respectfully request approval so Sonoma may receive improved Verizon service to the Sonoma Community.

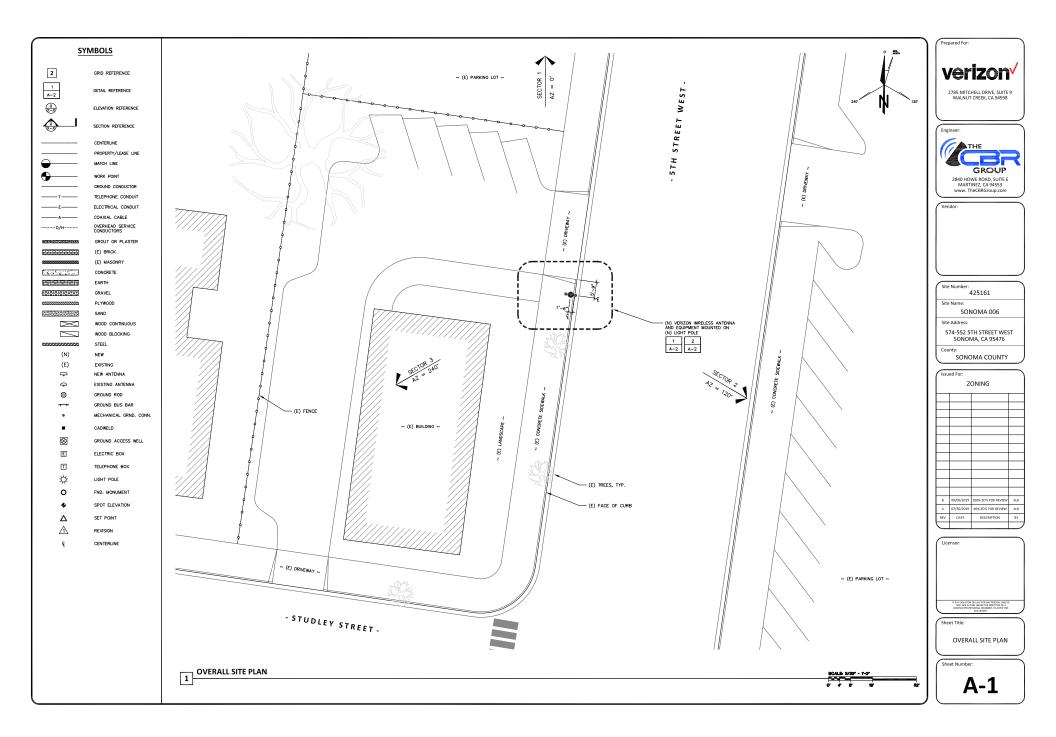
Sincerely, The CBR Group, Inc.

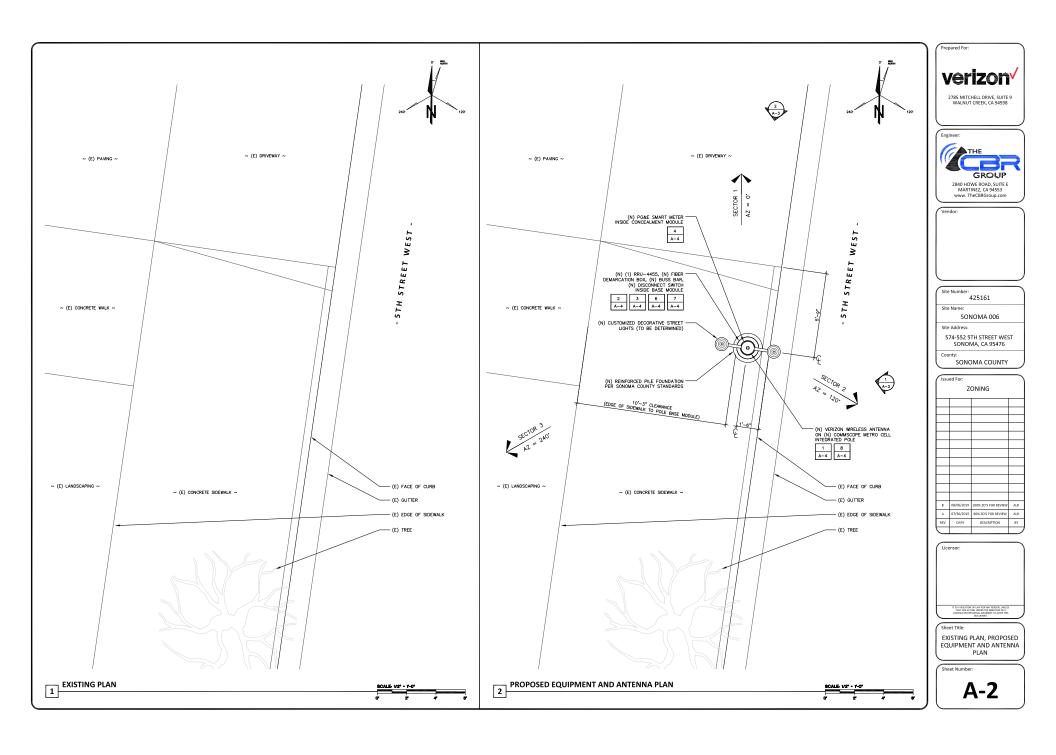
Christy Beltran (Authorized Agent for Verizon Wireless) Verizon Proposed Small Cell – "Commercial" Zoned Locations Presented by The CBR Group for Verizon Wireless "Sonoma 006, Sonoma 007, Sonoma 012"

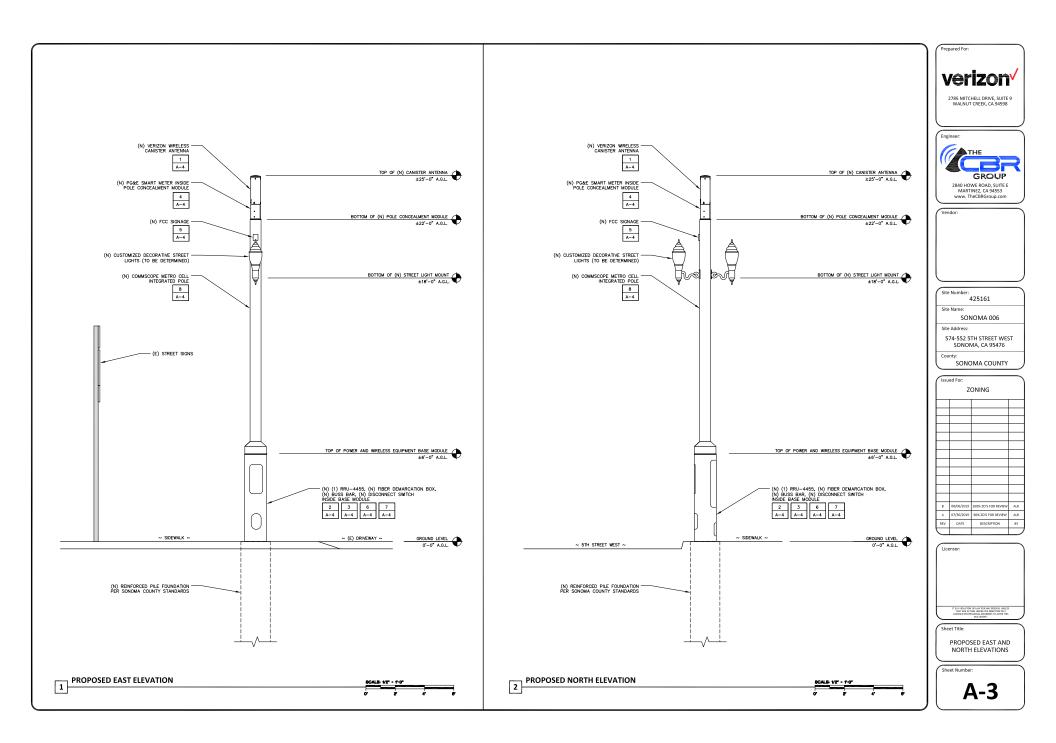
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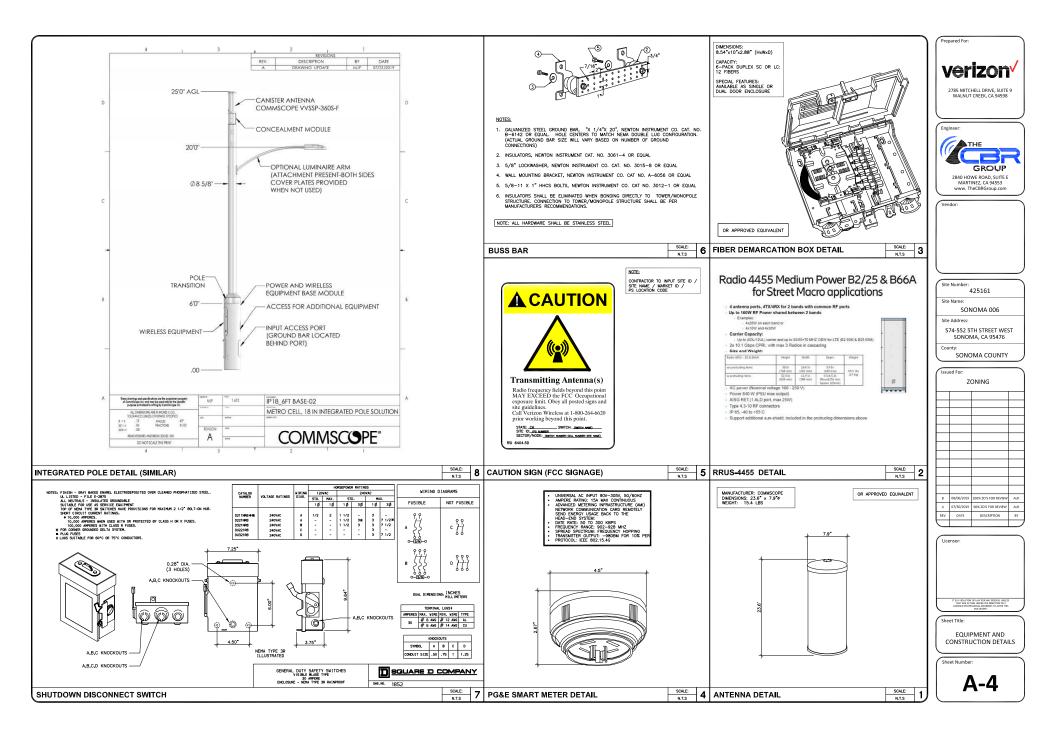
- Project Description Submittal Letter
- Sonoma 006 Construction Drawings
- Sonoma 006 Photo Simulations
- Sonoma 006 Revised EME Reports
- Sonoma 007 Construction Drawings
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- Sonoma 007 Revised EME Reports
- Sonoma 012 Construction Drawings
- Sonoma 012 Photo Simulations
- Sonoma 012 Revised EME Reports
- Sonoma 012 Proposed Site PROD Map

#### Prepared For verizon 2785 MITCHELL DRIVE, SUITE 9 WALNUT CREEK, CA 94598 Enginee **SONOMA 006** THE verizon -GROUP 574-552 5TH STREET WEST 2840 HOWE ROAD, SUITE E MARTINEZ, CA 94553 www.TheCBRGroup.con **SONOMA, CA 95476** Vando **STRUCTURE TYPE: STREET LIGHT LOCATION CODE: 425161** Site Numb 425161 Site Nam SONOMA 006 Site Address: 574-552 5TH STREET WEST SONOMA, CA 95476 County: PROJECT DESCRIPTION SHEET INDEX REV PROJECT TEAM VICINITY MAP SONOMA COUNTY TITLE SHEET в THIS IS AN UNMANNED WIRELESS TELECOMMUNICATION FACILITY FOR VERIZON WIRELESS CONSISTING OF THE INSTALLATION AND OPERATION OF AN ANTENNA AND ASSOCIATED EQUIPMENT. SCOPE OF WORK CONSISTS OF THE FOLLOWING: Epologix O A-1 OVERALL SITE PLAN В APPLICANT/LESSEE: 0 Valley Mart 🔿 sued Fo A-2 EXISTING PLAN, PROPOSED EQUIPMENT AND ANTENNA PLAN В VERIZON WIRELESS 2785 MITCHELL DRIVE, BLDG 9 WALNUT CREEK, CA 94598 ZONING INSTALL (N) COMMSCOPE METRO CELL INTEGRATED POLE AT OROUND LEVEL. INSTALL (N) CANSTER ANTENNA (N) (N) POLE. INSTALL (I) (N) FRUI INSER POLE BASE MODULE. INSTALL (I) (N) DISCONDERT SWITCH INSIDE POLE BASE MODULE. INSTALL (I) (N) PAGE SMART HETRI INSIDE POLE CONCLAMENT MODULE. A-3 PROPOSED EAST & NORTH ELEVATIONS В 0 EQUIPMENT AND CONSTRUCTION DETAILS в A-4 0 P y 12 S Wells Fargo Bank APPLICANT/ENGINEER: W Napa St St Francis S THE CBR GROUP 2840 HOWE ROAD, SUITE E MARTINEZ, CA 94553 00 PH: (925) 246-3212 EMAIL: projects@thecbrgroup.com SITE PROJECT INFORMATION 0 PROPOSED USE: STREET LIGHT & TELECOMMUNICATIONS FACILITY 0 JURISDICTION: B 08/06/2019 100% ZD'S FOR REVIE ALR CODE COMPLIANCE SONOMA COUNTY A 07/30/2019 90% ZD'S FOR REVIEW ALR DATE DESCRIPTION ALL WORK AND MATERIALS SHALL BE PERFORMED AND INSTALLED IN ACCORDANCE WITH THE CURRENT EDITIONS OF THE FOLLOWING CODES AS ADOPTED BY THE LOCAL GOVERNING AUTHORITIES. NOTHING IN THESE PLANS IS TO BE CONSTRUED TO PERMIT WORK NOT CONFORMING TO THESE CODES. BΥ LATITUDE: OCCUPANCY AND CONSTRUCTION TYPE 38.292309 OCCUPANCY : U (UNMANNED COMMUNICATIONS FACILITY) LONGITUDE: STRUCTURE PHOTO Licensor CONSTRUCTION TYPE: --122.468295 1) 2016 CALIFORNIA BUILDING CODE (CBC) HANDICAP REQUIREMENTS AMSL: 2) 2016 CALIFORNIA RESIDENTIAL CODE (CRC) FACILITY IS UNMANNED AND NOT FOR HUMAN HABITATION, ACCESSIBILITY ACCESS AND REQUIREMENTS ARE NOT REQUIRED, IN ACCORDANCE WITH CALIFORNIA STATE ADMINISTRATIVE CODE, PART 2, TITLE 24, SECTION 1103B.1, EXCEPTION 14 SECTION 11342.1, EXCEPTION 4. ±78.7' AMSL 3) 2016 CALIFORNIA HISTORICAL BUILDING CODE (CHBC) PROPERTY OWNER: 4) 2016 CALIFORNIA EXISTING BUILDING CODE (CEBC) ROW 5) 2016 CALIFORNIA GREEN BUILDINGS STANDARDS CODE (CGBSC) RADIO FREQUENCY DATA PLAN POLE OWNER: 6) 2016 CALIFORNIA FIRE CODE (CFC) PG&F 7) 2016 CALIFORNIA MECHANICAL CODE (CMC) INITIATIVE: REVISION LEVEL DATE: POWER AGENCY: 8) 2016 CALIFORNIA PLUMBING CODE (CPC) Sheet Title 9) 2016 CALIFORNIA ELECTRICAL CODE (CEC) PG&E 77 BEALE STREET SAN FRANCISCO, CA 94109 GENERAL CONTRACTOR NOTES 10) 2016 CALIFORNIA ENERGY CODE (CEC) PH: (800) 743-5000 TITLE SHEET 11) ANSI / EIA-TIA-222-G A REFOR 12) 2015 NFPA 101, LIFE SAFETY CODE DO NOT SCALE DRAWINGS THESE DRAWINGS ARE FORMATTED TO BE FULL SIZE AT 24" x 36". CONTRACTOR SHALL VERIFY ALL PLANS AND EXISTING DIMENSIONS AND CONDITIONS ON THE UDSITE AND SHALL IMMEDIATELY NOTIFY THE RECHTECT/EXISTINGER IN WRITING OF ANY DISCREPANCIES BEFORE PROCEEDING WITH THE WORK OR MATERIAL ORDERS OR BE RESPONSIBLE FOR THE SAME. 13) 2015 NFPA 72, NATIONAL FIRE ALARM CODE Sheet Number 14) 2015 NFPA 13, FIRE SPRINKLER CODE T-1 15) G.O. 95









SHOT MAP SONOMA 006\_Steel Light Pole 574-552 5<sup>th</sup> Street West Location Code: 425161

# PROPOSED SITE LOCATION





# SONOMA 006\_Steel Light Pole

574-552 5<sup>th</sup> St. West, Sonoma, CA 95476 Location Code: 425161





**SONOMA 006\_Steel Light Pole** 574-552 5<sup>th</sup> St. West, Sonoma, CA 95476 Location Code: 425161

VIEW 1: LOOKING SOUTHWEST ALONG 5<sup>™</sup> STREET WEST PHOTOSIMS PRODUCED 08/06/2019





SONOMA 006\_Steel Light Pole 574-552 5<sup>th</sup> St. West, Sonoma, CA 95476 Location Code: 425161

VIEW 2: LOOKING NORTHWEST ACROSS 5<sup>™</sup> STREET WEST PHOTOSIMS PRODUCED 08/06/2019



#### Verizon Wireless • Proposed Small Cell (No. 425161 "Sonoma 006") 574-552 Fifth Street West • Sonoma, California

#### Statement of Hammett & Edison, Inc., Consulting Engineers

The firm of Hammett & Edison, Inc., Consulting Engineers, has been retained on behalf of Verizon Wireless, a personal wireless telecommunications carrier, to evaluate its small cell (No. 425161 "Sonoma 006") proposed to be sited in Sonoma, California, for compliance with appropriate guidelines limiting human exposure to radio frequency ("RF") electromagnetic fields.

#### **Executive Summary**

Verizon proposes to install a cylindrical antenna on a light pole to be sited in the public right-of-way near 574-552 Fifth Street West in Sonoma. The proposed operation will comply with the FCC guidelines limiting public exposure to RF energy.

#### **Prevailing Exposure Standards**

The U.S. Congress requires that the Federal Communications Commission ("FCC") evaluate its actions for possible significant impact on the environment. A summary of the FCC's exposure limits is shown in Figure 1. These limits apply for continuous exposures and are intended to provide a prudent margin of safety for all persons, regardless of age, gender, size, or health. The most restrictive limit for exposures of unlimited duration at several wireless service bands are as follows:

| Wireless Service Band              | Transmit<br>Frequency | "Uncontrolled"<br>Public Limit | Occupational Limit<br>(5 times Public) |
|------------------------------------|-----------------------|--------------------------------|--|
| Microwave (point-to-point)         | 1–80 GHz              | 1.0 mW/cm <sup>2</sup>         | 5.0 mW/cm <sup>2</sup>                 |
| Millimeter-wave                    | 24–47                 | 1.0                            | 5.0                                    |
| Part 15 (WiFi & other unlicensed)  | 2-6                   | 1.0                            | 5.0                                    |
| CBRS (Citizens Broadband Radio)    | 3,550 MHz             | 1.0                            | 5.0                                    |
| BRS (Broadband Radio)              | 2,490                 | 1.0                            | 5.0                                    |
| WCS (Wireless Communication)       | 2,305                 | 1.0                            | 5.0                                    |
| AWS (Advanced Wireless)            | 2,110                 | 1.0                            | 5.0                                    |
| PCS (Personal Communication)       | 1,930                 | 1.0                            | 5.0                                    |
| Cellular                           | 869                   | 0.58                           | 2.9                                    |
| SMR (Specialized Mobile Radio)     | 854                   | 0.57                           | 2.85                                   |
| 700 MHz                            | 716                   | 0.48                           | 2.4                                    |
| 600 MHz                            | 617                   | 0.41                           | 2.05                                   |
| [most restrictive frequency range] | 30-300                | 0.20                           | 1.0                                    |

#### **General Facility Requirements**

Small cells typically consist of two distinct parts: the electronic transceivers (also called "radios" or "channels") that are connected to the traditional wired telephone lines, and the passive antennas that send the wireless signals created by the radios out to be received by individual subscriber units. The radios are typically mounted on the support pole or placed in a cabinet at ground level, and they are connected to the antennas by coaxial cables. Because of the short wavelength of the frequencies



#### Verizon Wireless • Proposed Small Cell (No. 425161 "Sonoma 006") 574-552 Fifth Street West • Sonoma, California

assigned by the FCC for wireless services, the antennas require line-of-sight paths for their signals to propagate well and so are installed at some height above ground. The antennas are designed to concentrate their energy toward the horizon, with very little energy wasted toward the sky or the ground. This means that it is generally not possible for exposure conditions to approach the maximum permissible exposure limits without being physically very near the antennas.

#### **Computer Modeling Method**

The FCC provides direction for determining compliance in its Office of Engineering and Technology Bulletin No. 65, "Evaluating Compliance with FCC-Specified Guidelines for Human Exposure to Radio Frequency Radiation," dated August 1997. Figure 2 describes the calculation methodologies, reflecting the facts that a directional antenna's radiation pattern is not fully formed at locations very close by (the "near-field" effect) and that at greater distances the power level from an energy source decreases with the square of the distance from it (the "inverse square law"). The conservative nature of this method for evaluating exposure conditions has been verified by numerous field tests.

#### Site and Facility Description

Based upon information provided by Verizon, including drawings by The CBR Group, dated August 6, 2019, it is proposed to install one CommScope Model VVSSP-360S-F, 2-foot tall, omnidirectional<sup>\*</sup> cylindrical antenna on top of the new light pole to be sited in the public right-of-way in front of the single-story commercial building at 531 Fifth Street West in Sonoma. The antenna would employ 7° downtilt and would be mounted at an effective height of about 24 feet above ground. The maximum effective radiated power proposed in any direction is 460 watts, representing simultaneous operation at 230 watts each for AWS and PCS service. There are reported no other wireless telecommunications base stations at the site or nearby.

#### **Study Results**

For a person anywhere at ground, the maximum RF exposure level due to the proposed Verizon operation is calculated to be 0.023 mW/cm<sup>2</sup>, which is 2.3% of the applicable public exposure limit. The maximum calculated level at the second-story elevation of any nearby building<sup>†</sup> is 7.4% of the public exposure limit. It should be noted that these results include several "worst-case" assumptions and therefore are expected to overstate actual power density levels from the proposed operation.

Assumed to be omnidirectional, although manufacturer's patterns show reduced power in certain directions.

Located at least 30 feet away, based on the drawings.

#### Verizon Wireless • Proposed Small Cell (No. 425161 "Sonoma 006") 574-552 Fifth Street West • Sonoma, California

#### No Recommended Compliance Measures

Due to its mounting location and height, the antenna would not be accessible to unauthorized persons, and so no measures are necessary to comply with the FCC public exposure guidelines. It is presumed that Verizon will, as an FCC licensee, take adequate steps to ensure that its employees or contractors receive appropriate training and comply with FCC occupational exposure guidelines whenever work is required near the antennas themselves.

#### Conclusion

Based on the information and analysis above, it is the undersigned's professional opinion that operation of the small cell proposed by Verizon Wireless near 574-552 Fifth Street West in Sonoma, California, will comply with the prevailing standards for limiting public exposure to radio frequency energy and, therefore, will not for this reason cause a significant impact on the environment. The highest calculated level in publicly accessible areas is much less than the prevailing standards allow for exposures of unlimited duration. This finding is consistent with measurements of actual exposure conditions taken at other operating small cells.

#### Authorship

The undersigned author of this statement is a qualified Professional Engineer, holding California Registration No. E-21306, which expires on September 30, 2019. This work has been carried out under his direction, and all statements are true and correct of his own knowledge except, where noted, when data has been supplied by others, which data he believes to be correct.



August 8, 2019

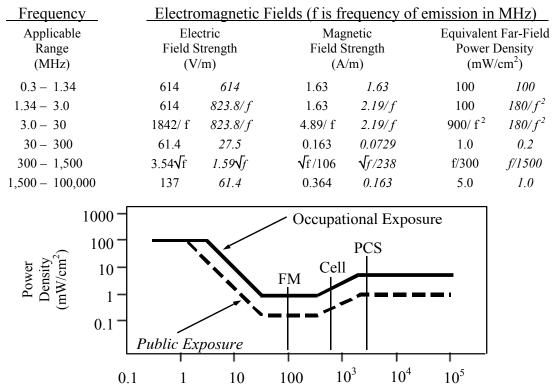


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#### FCC Radio Frequency Protection Guide

The U.S. Congress required (1996 Telecom Act) the Federal Communications Commission ("FCC") to adopt a nationwide human exposure standard to ensure that its licensees do not, cumulatively, have a significant impact on the environment. The FCC adopted the limits from Report No. 86, "Biological Effects and Exposure Criteria for Radiofrequency Electromagnetic Fields," published in 1986 by the Congressionally chartered National Council on Radiation Protection and Measurements ("NCRP"). Separate limits apply for occupational and public exposure conditions, with the latter limits generally five times more restrictive. The more recent standard, developed by the Institute of Electrical and Electronics Engineers and approved as American National Standard ANSI/IEEE C95.1-2006, "Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz," includes similar limits. These limits apply for continuous exposures from all sources and are intended to provide a prudent margin of safety for all persons, regardless of age, gender, size, or health.

As shown in the table and chart below, separate limits apply for occupational and public exposure conditions, with the latter limits (in *italics* and/or dashed) up to five times more restrictive:



Frequency (MHz)

Higher levels are allowed for short periods of time, such that total exposure levels averaged over six or thirty minutes, for occupational or public settings, respectively, do not exceed the limits, and higher levels also are allowed for exposures to small areas, such that the spatially averaged levels do not exceed the limits. However, neither of these allowances is incorporated in the conservative calculation formulas in the FCC Office of Engineering and Technology Bulletin No. 65 (August 1997) for projecting field levels. Hammett & Edison has built those formulas into a proprietary program that calculates, at each location on an arbitrary rectangular grid, the total expected power density from any number of individual radio sources. The program allows for the description of buildings and uneven terrain, if required to obtain more accurate projections.

# RFR.CALC<sup>™</sup> Calculation Methodology

#### Assessment by Calculation of Compliance with FCC Exposure Guidelines

The U.S. Congress required (1996 Telecom Act) the Federal Communications Commission ("FCC") to adopt a nationwide human exposure standard to ensure that its licensees do not, cumulatively, have a significant impact on the environment. The maximum permissible exposure limits adopted by the FCC (see Figure 1) apply for continuous exposures from all sources and are intended to provide a prudent margin of safety for all persons, regardless of age, gender, size, or health. Higher levels are allowed for short periods of time, such that total exposure levels averaged over six or thirty minutes, for occupational or public settings, respectively, do not exceed the limits.

#### Near Field.

Prediction methods have been developed for the near field zone of panel (directional) and whip (omnidirectional) antennas, typical at wireless telecommunications base stations, as well as dish (aperture) antennas, typically used for microwave links. The antenna patterns are not fully formed in the near field at these antennas, and the FCC Office of Engineering and Technology Bulletin No. 65 (August 1997) gives suitable formulas for calculating power density within such zones.

For a panel or whip antenna, power density  $S = \frac{180}{\theta_{BW}} \times \frac{0.1 \times P_{net}}{\pi \times D \times h}$ , in mW/cm<sup>2</sup>,

and for an aperture antenna, maximum power density  $S_{max} = \frac{0.1 \times 16 \times \eta \times P_{net}}{\pi \times h^2}$ , in mW/cm<sup>2</sup>,

where  $\theta_{BW}$  = half-power beamwidth of antenna, in degrees,

 $P_{net}$  = net power input to antenna, in watts,

D = distance from antenna, in meters,

h = aperture height of antenna, in meters, and

 $\eta$  = aperture efficiency (unitless, typically 0.5-0.8).

The factor of 0.1 in the numerators converts to the desired units of power density.

#### Far Field.

OET-65 gives this formula for calculating power density in the far field of an individual RF source:

power density 
$$\mathbf{S} = \frac{2.56 \times 1.64 \times 100 \times \mathrm{RFF}^2 \times \mathrm{ERP}}{4 \times \pi \times \mathrm{D}^2}$$
, in mW/cm<sup>2</sup>,

where ERP = total ERP (all polarizations), in kilowatts,

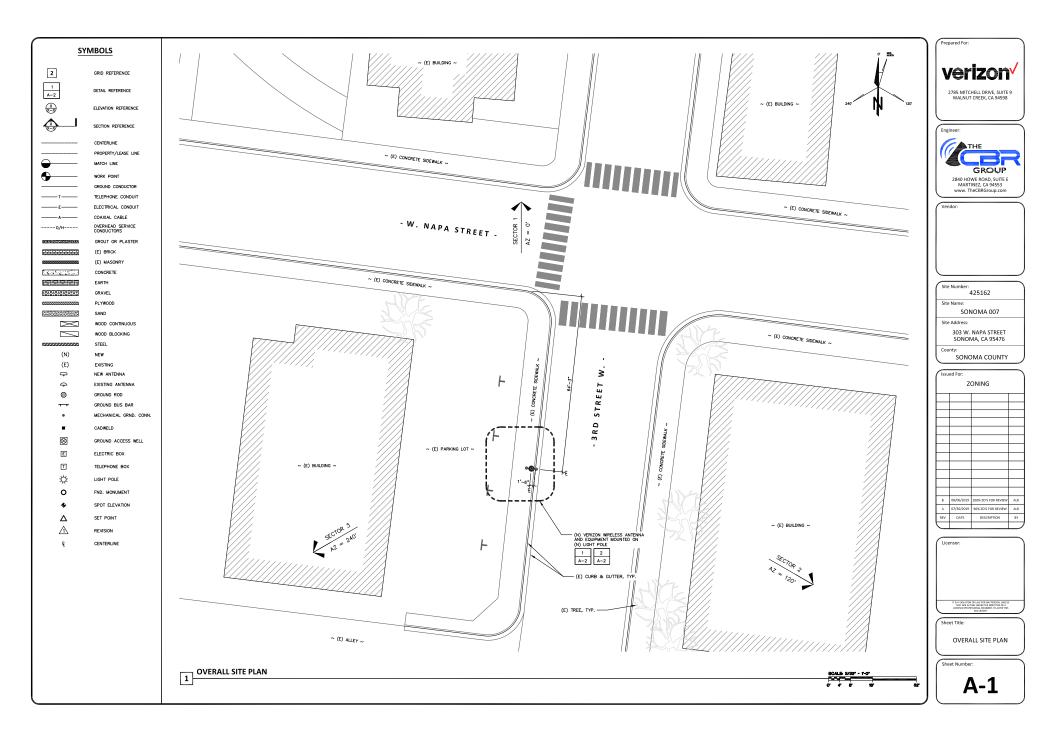
RFF = three-dimensional relative field factor toward point of calculation, and

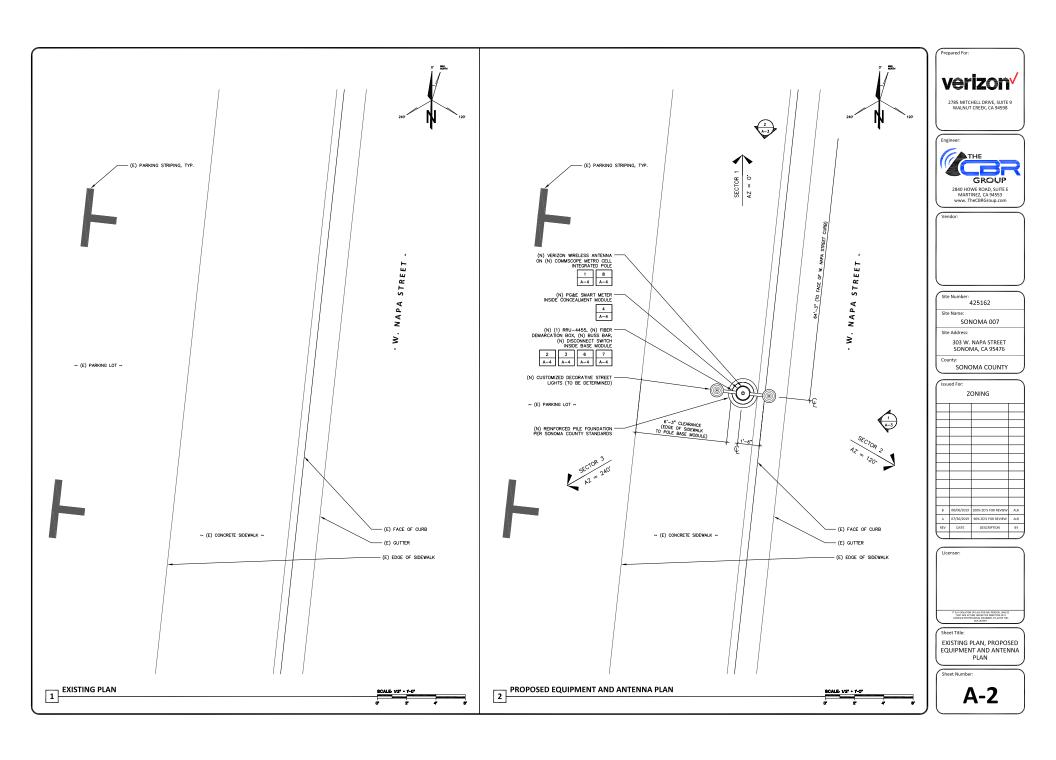
D = distance from antenna effective height to point of calculation, in meters.

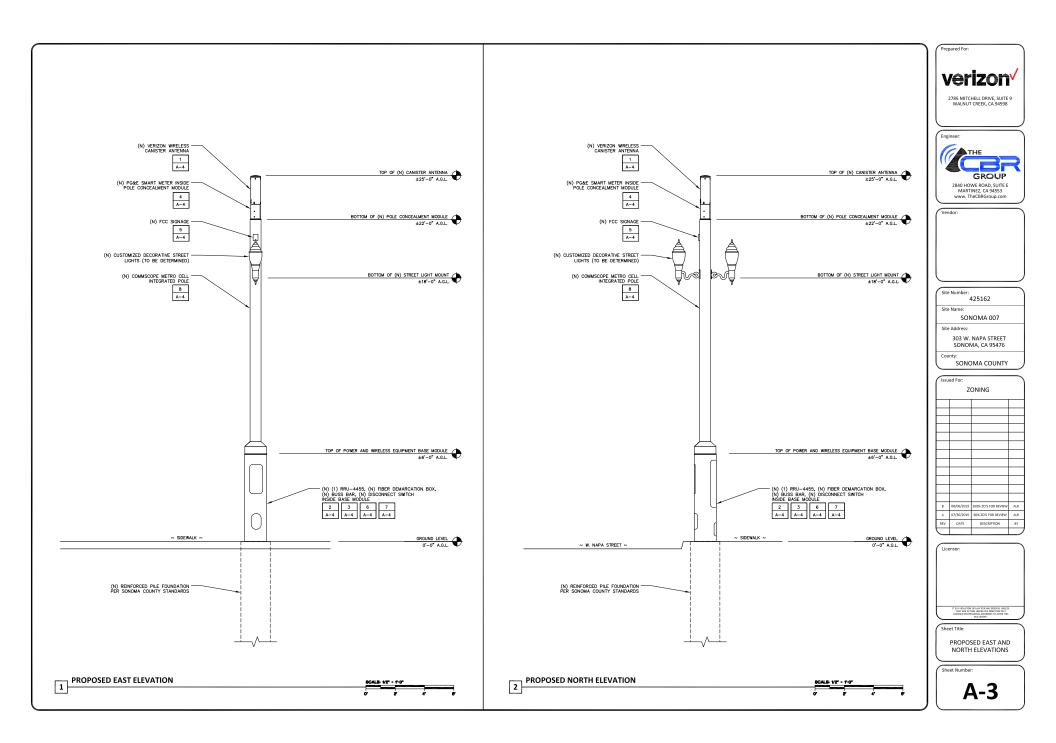
The factor of 2.56 accounts for the increase in power density due to ground reflection, assuming a reflection coefficient of 1.6 ( $1.6 \times 1.6 = 2.56$ ). The factor of 1.64 is the gain of a half-wave dipole relative to an isotropic radiator. The factor of 100 in the numerator converts to the desired units of power density. This formula is used in a computer program capable of calculating, at thousands of locations on an arbitrary grid, the total expected power density from any number of individual radio frequency sources. The program also allows for the inclusion of uneven terrain in the vicinity, as well as any number of nearby buildings, to obtain more accurate projections.

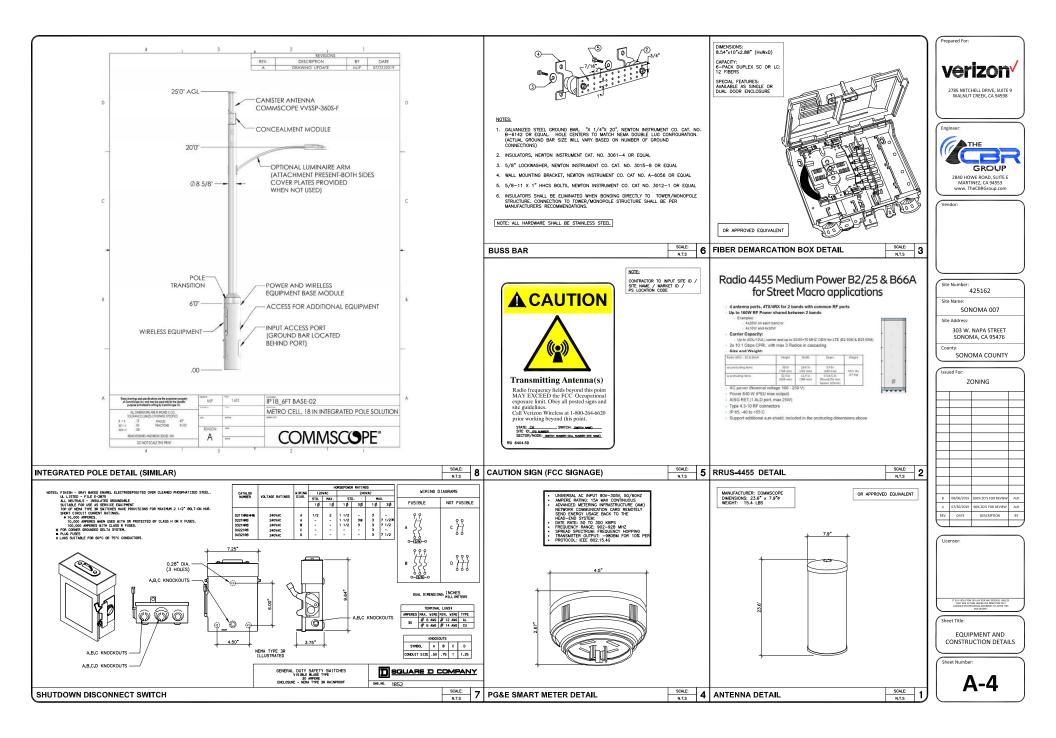


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# SHOT MAP SONOMA 007\_Steel Light Pole 303 W. Napa Street Location Code: 425162

# PROPOSED SITE LOCATION



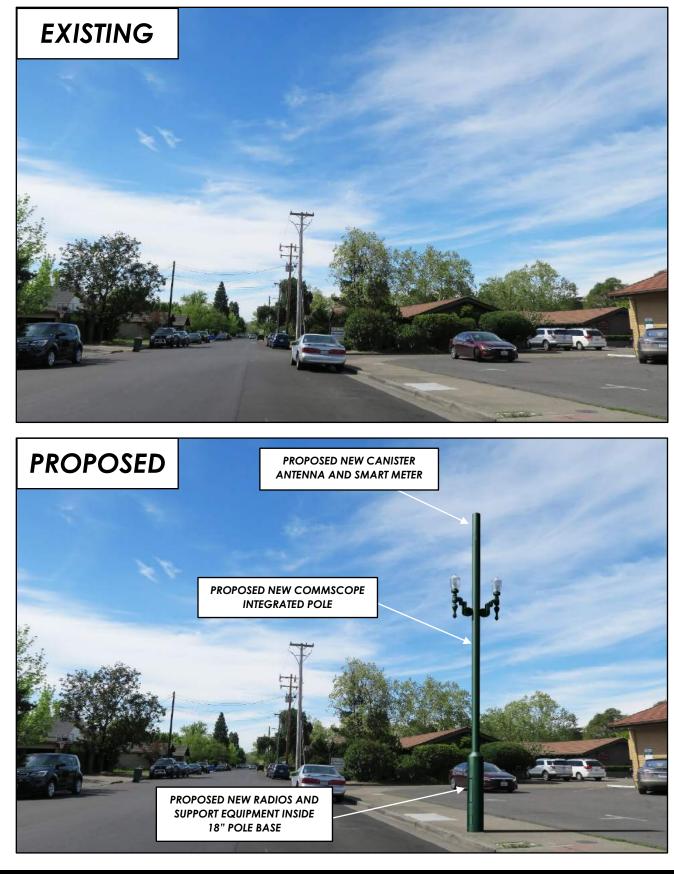




### SONOMA 007\_Steel Light Pole 303 W. Napa Street

Sonoma, CA 95476 Location Code: 425158





SONOMA 007\_Steel Light Pole 303 W. Napa Street Sonoma, CA 95476 Location Code: 425158

VIEW 1: LOOKING SOUTHWEST ALONG WEST NAPA STREET PHOTOSIMS PRODUCED 08/06/2019





SONOMA 007\_Steel Light Pole 303 W. Napa Street Sonoma, CA 95476 Location Code: 425158

VIEW 2: LOOKING WEST ACROSS W. NAPA STREET PHOTOSIMS PRODUCED 08/06/2019



#### Verizon Wireless • Proposed Small Cell (No. 425162 "Sonoma 007") 303 West Napa Street • Sonoma, California

#### Statement of Hammett & Edison, Inc., Consulting Engineers

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| Wireless Service Band              | Transmit<br>Frequency | "Uncontrolled"<br>Public Limit | Occupational Limit<br>(5 times Public) |
|------------------------------------|-----------------------|--------------------------------|--|
| Microwave (point-to-point)         | 1–80 GHz              | 1.0 mW/cm <sup>2</sup>         | 5.0 mW/cm <sup>2</sup>                 |
| Millimeter-wave                    | 24–47                 | 1.0                            | 5.0                                    |
| Part 15 (WiFi & other unlicensed)  | 2-6                   | 1.0                            | 5.0                                    |
| CBRS (Citizens Broadband Radio)    | 3,550 MHz             | 1.0                            | 5.0                                    |
| BRS (Broadband Radio)              | 2,490                 | 1.0                            | 5.0                                    |
| WCS (Wireless Communication)       | 2,305                 | 1.0                            | 5.0                                    |
| AWS (Advanced Wireless)            | 2,110                 | 1.0                            | 5.0                                    |
| PCS (Personal Communication)       | 1,930                 | 1.0                            | 5.0                                    |
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| 700 MHz                            | 716                   | 0.48                           | 2.4                                    |
| 600 MHz                            | 617                   | 0.41                           | 2.05                                   |
| [most restrictive frequency range] | 30-300                | 0.20                           | 1.0                                    |

#### **General Facility Requirements**

Small cells typically consist of two distinct parts: the electronic transceivers (also called "radios" or "channels") that are connected to the traditional wired telephone lines, and the passive antennas that send the wireless signals created by the radios out to be received by individual subscriber units. The radios are typically mounted on the support pole or placed in a cabinet at ground level, and they are connected to the antennas by coaxial cables. Because of the short wavelength of the frequencies



#### Verizon Wireless • Proposed Small Cell (No. 425162 "Sonoma 007") 303 West Napa Street • Sonoma, California

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#### **Computer Modeling Method**

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#### **Site and Facility Description**

Based upon information provided by Verizon, including drawings by The CBR Group, dated August 6, 2019, it is proposed to install one CommScope Model VVSSP-360S-F, 2-foot tall, omnidirectional<sup>\*</sup> cylindrical antenna on top of the new light pole to be sited in the public right-of-way on the west side of Third Street West, adjacent to the single-story commercial building at 303 West Napa Street in Sonoma. The antenna would employ 7° downtilt and would be mounted at an effective height of about 24 feet above ground. The maximum effective radiated power proposed in any direction is 460 watts, representing simultaneous operation at 230 watts each for AWS and PCS service. There are reported no other wireless telecommunications base stations at the site or nearby.

#### **Study Results**

For a person anywhere at ground, the maximum RF exposure level due to the proposed Verizon operation is calculated to be 0.023 mW/cm<sup>2</sup>, which is 2.3% of the applicable public exposure limit. The maximum calculated level at the second-story elevation of any nearby building<sup>†</sup> is 6.2% of the public exposure limit. It should be noted that these results include several "worst-case" assumptions and therefore are expected to overstate actual power density levels from the proposed operation.

Assumed to be omnidirectional, although manufacturer's patterns show reduced power in certain directions.

Located at least 45 feet away, based on the drawings.

#### Verizon Wireless • Proposed Small Cell (No. 425162 "Sonoma 007") 303 West Napa Street • Sonoma, California

#### No Recommended Compliance Measures

Due to its mounting location and height, the antenna would not be accessible to unauthorized persons, and so no measures are necessary to comply with the FCC public exposure guidelines. It is presumed that Verizon will, as an FCC licensee, take adequate steps to ensure that its employees or contractors receive appropriate training and comply with FCC occupational exposure guidelines whenever work is required near the antennas themselves.

#### Conclusion

Based on the information and analysis above, it is the undersigned's professional opinion that operation of the small cell proposed by Verizon Wireless near 303 West Napa Street in Sonoma, California, will comply with the prevailing standards for limiting public exposure to radio frequency energy and, therefore, will not for this reason cause a significant impact on the environment. The highest calculated level in publicly accessible areas is much less than the prevailing standards allow for exposures of unlimited duration. This finding is consistent with measurements of actual exposure conditions taken at other operating small cells.

#### Authorship

The undersigned author of this statement is a qualified Professional Engineer, holding California Registration No. E-21306, which expires on September 30, 2019. This work has been carried out under his direction, and all statements are true and correct of his own knowledge except, where noted, when data has been supplied by others, which data he believes to be correct.



August 8, 2019

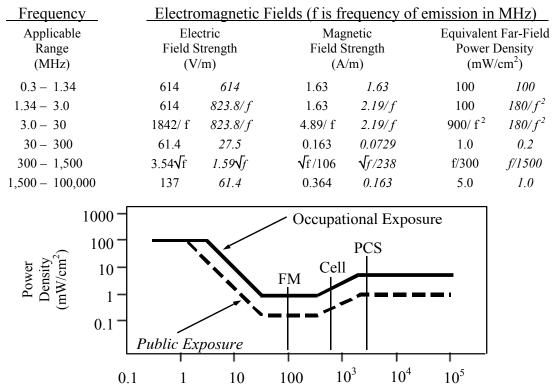


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#### FCC Radio Frequency Protection Guide

The U.S. Congress required (1996 Telecom Act) the Federal Communications Commission ("FCC") to adopt a nationwide human exposure standard to ensure that its licensees do not, cumulatively, have a significant impact on the environment. The FCC adopted the limits from Report No. 86, "Biological Effects and Exposure Criteria for Radiofrequency Electromagnetic Fields," published in 1986 by the Congressionally chartered National Council on Radiation Protection and Measurements ("NCRP"). Separate limits apply for occupational and public exposure conditions, with the latter limits generally five times more restrictive. The more recent standard, developed by the Institute of Electrical and Electronics Engineers and approved as American National Standard ANSI/IEEE C95.1-2006, "Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz," includes similar limits. These limits apply for continuous exposures from all sources and are intended to provide a prudent margin of safety for all persons, regardless of age, gender, size, or health.

As shown in the table and chart below, separate limits apply for occupational and public exposure conditions, with the latter limits (in *italics* and/or dashed) up to five times more restrictive:



Frequency (MHz)

Higher levels are allowed for short periods of time, such that total exposure levels averaged over six or thirty minutes, for occupational or public settings, respectively, do not exceed the limits, and higher levels also are allowed for exposures to small areas, such that the spatially averaged levels do not exceed the limits. However, neither of these allowances is incorporated in the conservative calculation formulas in the FCC Office of Engineering and Technology Bulletin No. 65 (August 1997) for projecting field levels. Hammett & Edison has built those formulas into a proprietary program that calculates, at each location on an arbitrary rectangular grid, the total expected power density from any number of individual radio sources. The program allows for the description of buildings and uneven terrain, if required to obtain more accurate projections.

# RFR.CALC<sup>™</sup> Calculation Methodology

#### Assessment by Calculation of Compliance with FCC Exposure Guidelines

The U.S. Congress required (1996 Telecom Act) the Federal Communications Commission ("FCC") to adopt a nationwide human exposure standard to ensure that its licensees do not, cumulatively, have a significant impact on the environment. The maximum permissible exposure limits adopted by the FCC (see Figure 1) apply for continuous exposures from all sources and are intended to provide a prudent margin of safety for all persons, regardless of age, gender, size, or health. Higher levels are allowed for short periods of time, such that total exposure levels averaged over six or thirty minutes, for occupational or public settings, respectively, do not exceed the limits.

#### Near Field.

Prediction methods have been developed for the near field zone of panel (directional) and whip (omnidirectional) antennas, typical at wireless telecommunications base stations, as well as dish (aperture) antennas, typically used for microwave links. The antenna patterns are not fully formed in the near field at these antennas, and the FCC Office of Engineering and Technology Bulletin No. 65 (August 1997) gives suitable formulas for calculating power density within such zones.

For a panel or whip antenna, power density  $S = \frac{180}{\theta_{BW}} \times \frac{0.1 \times P_{net}}{\pi \times D \times h}$ , in mW/cm<sup>2</sup>,

and for an aperture antenna, maximum power density  $S_{max} = \frac{0.1 \times 16 \times \eta \times P_{net}}{\pi \times h^2}$ , in mW/cm<sup>2</sup>,

where  $\theta_{BW}$  = half-power beamwidth of antenna, in degrees,

 $P_{net}$  = net power input to antenna, in watts,

D = distance from antenna, in meters,

h = aperture height of antenna, in meters, and

 $\eta$  = aperture efficiency (unitless, typically 0.5-0.8).

The factor of 0.1 in the numerators converts to the desired units of power density.

#### Far Field.

OET-65 gives this formula for calculating power density in the far field of an individual RF source:

power density 
$$\mathbf{S} = \frac{2.56 \times 1.64 \times 100 \times \mathrm{RFF}^2 \times \mathrm{ERP}}{4 \times \pi \times \mathrm{D}^2}$$
, in mW/cm<sup>2</sup>,

where ERP = total ERP (all polarizations), in kilowatts,

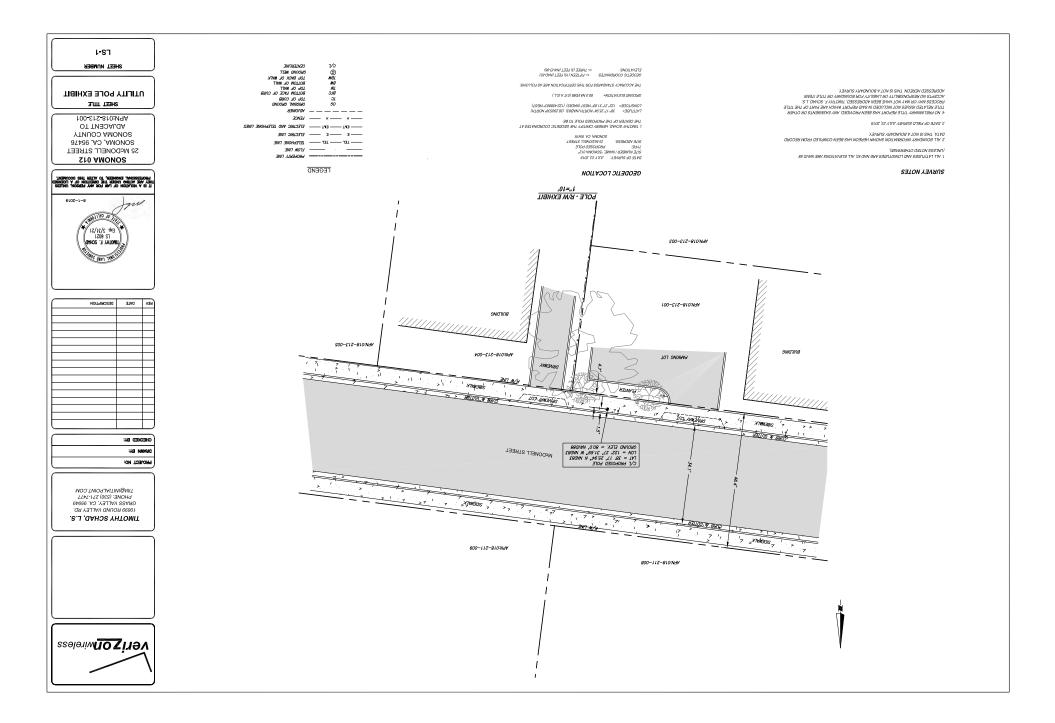
RFF = three-dimensional relative field factor toward point of calculation, and

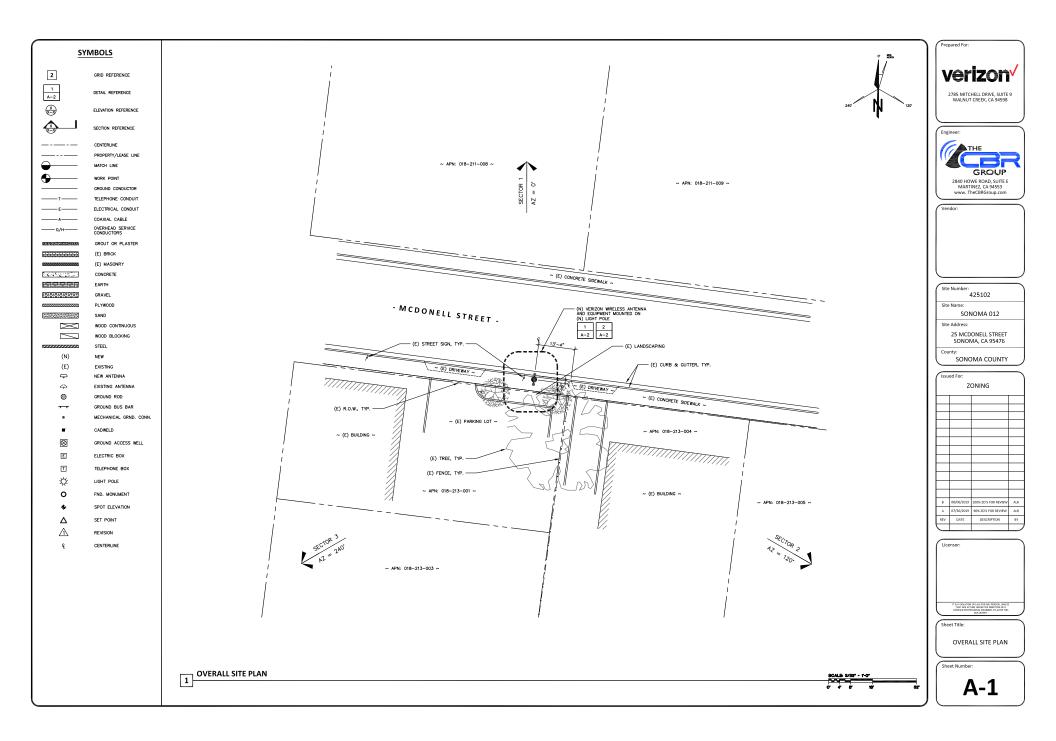
D = distance from antenna effective height to point of calculation, in meters.

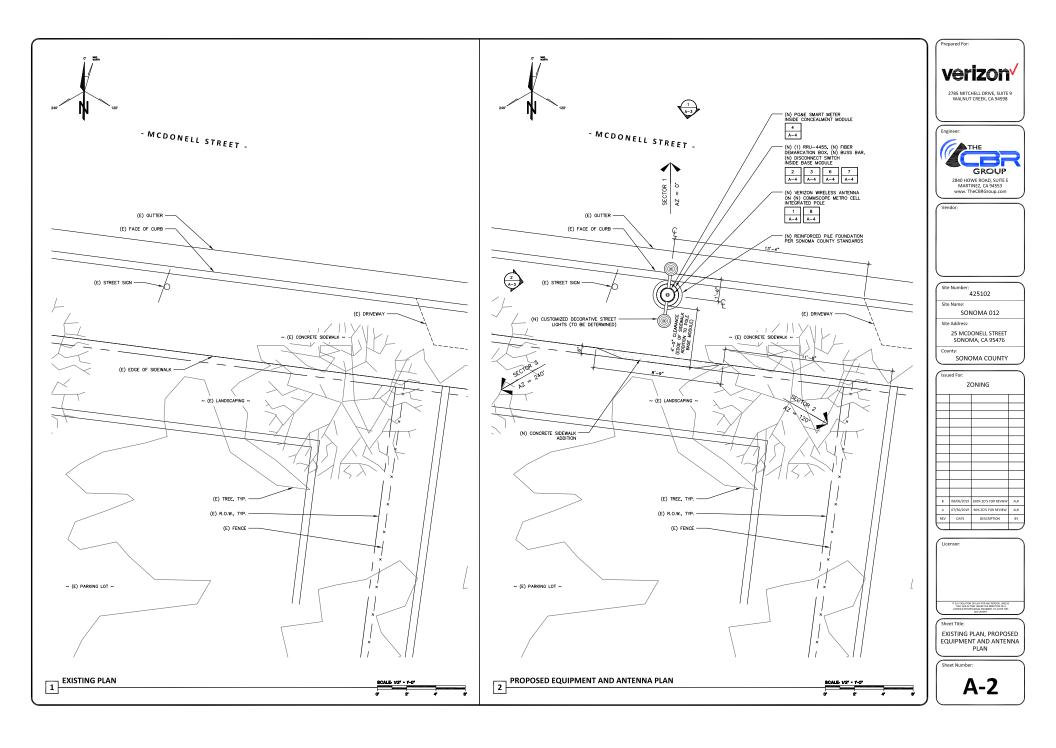
The factor of 2.56 accounts for the increase in power density due to ground reflection, assuming a reflection coefficient of 1.6 ( $1.6 \times 1.6 = 2.56$ ). The factor of 1.64 is the gain of a half-wave dipole relative to an isotropic radiator. The factor of 100 in the numerator converts to the desired units of power density. This formula is used in a computer program capable of calculating, at thousands of locations on an arbitrary grid, the total expected power density from any number of individual radio frequency sources. The program also allows for the inclusion of uneven terrain in the vicinity, as well as any number of nearby buildings, to obtain more accurate projections.

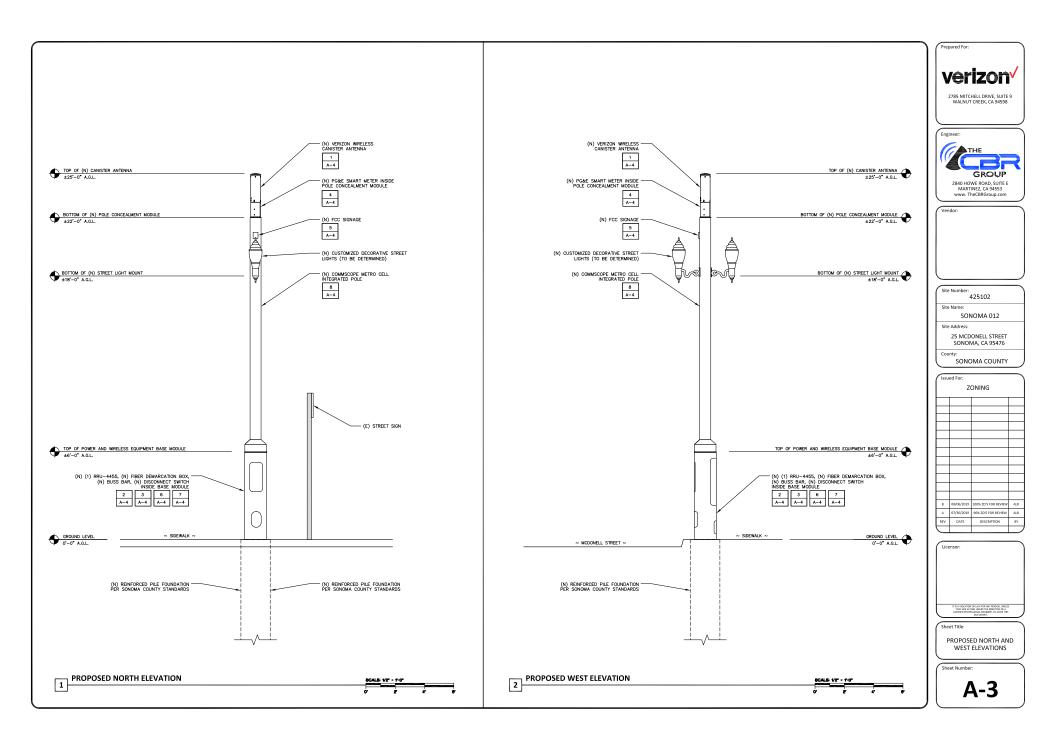


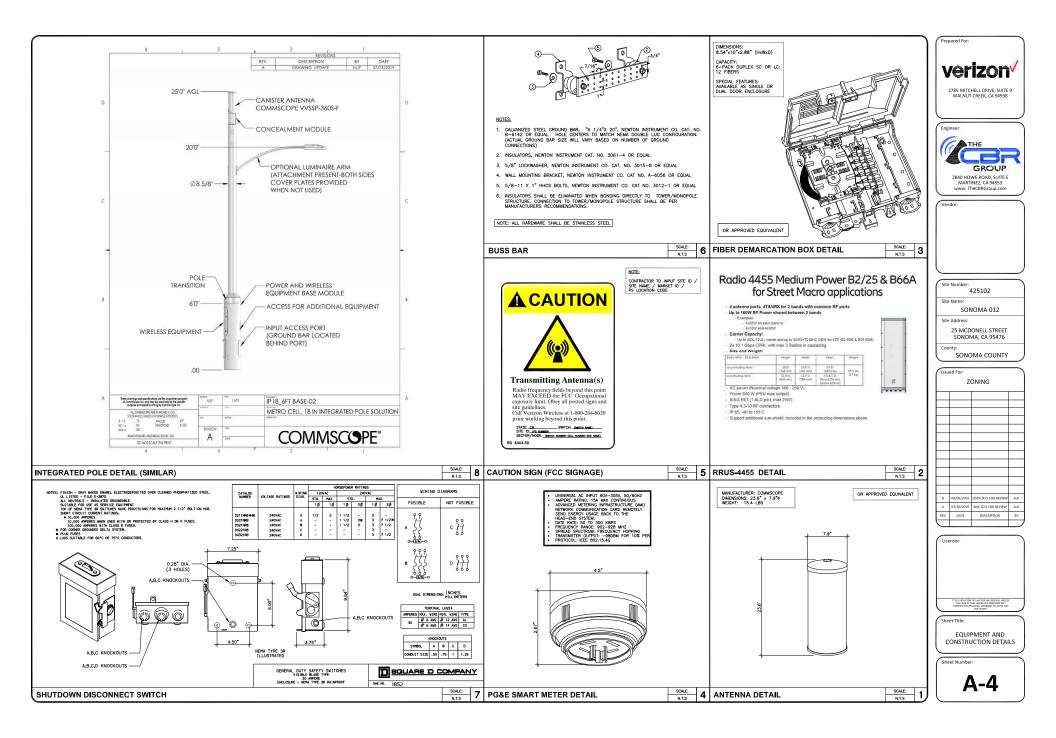
| 25 MCDO<br>SONOM<br>STRUCTURE T   | <b>DNELL STREET</b><br>A, CA 95476<br>YPE: STREET LIGHT<br>CODE: 425102   | ve   | rizon  | Prepared For:<br>Verizon<br>Arss Mitchell DRive, SUITE 9<br>WALNUT CREEK, CA 94598<br>Engineer:<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Control<br>Co |
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|   |   | PROJECT INFORMATION PROPOSED USE: STREET LIGHT & TELECOMMUNICATIONS FACILITY                               | Winny Staten<br>600 Tasting House Peer's Coffee 9  |  |
| CODE COMPLIANCE   |   | JURISDICTION:<br>SONOMA COUNTY   | WilliamsScroma   | B         08/06/2019         100% ZD'S FOR REVIEW         ALR           A         07/30/2019         90% ZD'S FOR REVIEW         ALR   |
| ALL WORK AND MATERIALS SHALL BE PERFORMED AND INSTALLED IN ACCORDANCE WITH<br>THE CURRENT EDITIONS OF THE FOLLOWING CODES AS ADOPTED BY THE LOCAL<br>COVERING AUTHORITIES. NOTING IN THESE PLANS IS TO BE CONSTRUED TO PERMIT<br>WORK NOT COVERIMING TO THESE CODES.  | OCCUPANCY AND CONSTRUCTION TYPE   | LATITUDE:<br>38.290539<br>LONGITUDE:   | Patter of Concernment   | A D0/30/X019 V08/2015 KOKREVIEW ALK<br>REV DATE DESCRIPTION BY   |
| 1) 2016 CALFORNIA BUILDING CODE (CBC)<br>2) 2016 CALFORNIA RESIDENTIAL CODE (CRC)<br>3) 2016 CALFORNIA HISTORICAL BUILDING CODE (CHBC)<br>4) 2016 CALFORNIA ENSTING BUILDING STANDARDS CODE (CGBSC)<br>5) 2016 CALFORNIA GREEN BUILDINGS STANDARDS CODE (CGBSC)   | CONSTRUCTION TYPE: -<br><u>HANDICAP ECQUIERENTS</u><br>FACILITY S INMANNED AND NOT FOR HUMAN HABITATION, ACCESSIBILITY ACCESS AND REQUIREMENTS ARE NOT<br>REQUIRED, N. ACCORDANCE WITH OLIFORINA STATE ADMINISTRATIVE CODE, PART 2, TITLE 24, SECTION 1103B-1,<br>REQUIRED, N. ACCORDANCE WITH OLIFORINA STATE ADMINISTRATIVE CODE, PART 2, TITLE 24, SECTION 1103B-1,<br>PARTICLE ADMINISTRATIVE CODE, PART 2, TITLE ADMINISTRATIVE CODE, PART 2, TITLE 24, SECTION 1103B-1,<br>PARTICLE ADMINISTRATIVE ADMINISTRATIVE CODE, PART 2, TITLE 24, SECTION 1103B-1,<br>PARTICLE ADMINISTRATIVE ADMINIST | -122.458803<br><u>AMSL:</u><br>±80.0' AMSL<br><u>PROPERTY OWNER:</u><br>R.O.W.                             | STRUCTURE PHOTO  | Ücensor:   |
| <ul> <li>6) 2016 CALIFORNA FIRE CODE (CFC)</li> <li>7) 2016 CALIFORNA PLUMBING CODE (CPC)</li> <li>8) 2016 CALIFORNA PLUMBING CODE (CPC)</li> <li>9) 2016 CALIFORNA LECETRICAL CODE (CEC)</li> <li>10) 2016 CALIFORNA ENERY CODE (CEC)</li> <li>11) ANSI / EA-TA-222-G</li> </ul>   |   | POLE OWNER:<br>PGAE<br>POWER AGENCY:<br>PGAE<br>PGAE STREET<br>SM FRANCSCO, CA 94109<br>PH: (800) 743-5000 |  | IT EARLIST OF LARGE THE THE ANALY AND THE ADART OF THE AD   |
| 12) 2015 NFPA 101, LIFE SAFETY CODE<br>13) 2015 NFPA 72, NATIONAL FIRE ALARM CODE<br>14) 2015 NFPA 13, FIRE SPRINKLER CODE<br>15) 0.0. 95   | DO NOT SCALE DRAWINGS<br>THESE DRAWINGS ARE FORMATED TO BE FULL SIZE AT 24" x 36", CONTRACTOR<br>SHALL VERY ALL PLANE AND DOSTING DIAENSIONS AND CONDITIONS ON THE<br>OSSITE AND SHALL BAREDURELY NOTIFY THE ANOHELEY PLANE AND AND AND<br>AND AND AND AND AND AND AND AND AND AND  |  |  | Sheet Number:<br><b>T-1</b>  |











# SHOT MAP SONOMA 012\_Alternate 25 McDonell Street Location Code: 425102

# PROPOSED SITE LOCATION





# SONOMA 012\_Alternate 25 McDonell Street

Sonoma, CA 95476 Location Code: 425102



The CBR Group 2840 Howe Road, Ste. E Martinez, CA 94553 info@thecbrgroup.com



**SONOMA 012\_Alternate** 25 McDonell Street Sonoma, CA 95476 Location Code: 425102

VIEW 1: LOOKING SOUTHEAST ACROSS MCDONELL STREET PHOTOSIMS PRODUCED 08/05/2019



The CBR Group 2840 Howe Road, Ste. E Martinez, CA 94553 info@thecbrgroup.com



**SONOMA 012\_Alternate** 25 McDonell Street Sonoma, CA 95476 Location Code: 425102

VIEW 2: LOOKING SOUTHWEST ACROSS MCDONELL STREET PHOTOSIMS PRODUCED 08/05/2019



The CBR Group 2840 Howe Road, Ste. E Martinez, CA 94553 info@thecbrgroup.com

#### Verizon Wireless • Proposed Small Cell (No. 425102 "Sonoma 012") 25 McDonell Street • Sonoma, California

#### Statement of Hammett & Edison, Inc., Consulting Engineers

The firm of Hammett & Edison, Inc., Consulting Engineers, has been retained on behalf of Verizon Wireless, a personal wireless telecommunications carrier, to evaluate its small cell (No. 425102 "Sonoma 012") proposed to be sited in Sonoma, California, for compliance with appropriate guidelines limiting human exposure to radio frequency ("RF") electromagnetic fields.

#### **Executive Summary**

Verizon proposes to install a cylindrical antenna on a light pole to be sited in the public right-of-way near 25 McDonell Street in Sonoma. The proposed operation will comply with the FCC guidelines limiting public exposure to RF energy.

#### **Prevailing Exposure Standards**

The U.S. Congress requires that the Federal Communications Commission ("FCC") evaluate its actions for possible significant impact on the environment. A summary of the FCC's exposure limits is shown in Figure 1. These limits apply for continuous exposures and are intended to provide a prudent margin of safety for all persons, regardless of age, gender, size, or health. The most restrictive limit for exposures of unlimited duration at several wireless service bands are as follows:

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#### **General Facility Requirements**

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#### Verizon Wireless • Proposed Small Cell (No. 425102 "Sonoma 012") 25 McDonell Street • Sonoma, California

assigned by the FCC for wireless services, the antennas require line-of-sight paths for their signals to propagate well and so are installed at some height above ground. The antennas are designed to concentrate their energy toward the horizon, with very little energy wasted toward the sky or the ground. This means that it is generally not possible for exposure conditions to approach the maximum permissible exposure limits without being physically very near the antennas.

#### **Computer Modeling Method**

The FCC provides direction for determining compliance in its Office of Engineering and Technology Bulletin No. 65, "Evaluating Compliance with FCC-Specified Guidelines for Human Exposure to Radio Frequency Radiation," dated August 1997. Figure 2 describes the calculation methodologies, reflecting the facts that a directional antenna's radiation pattern is not fully formed at locations very close by (the "near-field" effect) and that at greater distances the power level from an energy source decreases with the square of the distance from it (the "inverse square law"). The conservative nature of this method for evaluating exposure conditions has been verified by numerous field tests.

#### Site and Facility Description

Based upon information provided by Verizon, including drawings by The CBR Group, dated August 6, 2019, it is proposed to install one CommScope Model VVSSP-360S-F, 2-foot tall, omnidirectional<sup>\*</sup> cylindrical antenna on top of the new light pole to be sited in the public right-of-way in front of the two-story office building at 25 McDonell Street in Sonoma. The antenna would employ 7° downtilt and would be mounted at an effective height of about 24 feet above ground. The maximum effective radiated power proposed in any direction is 460 watts, representing simultaneous operation at 230 watts each for AWS and PCS service. There are reported no other wireless telecommunications base stations at the site or nearby.

#### **Study Results**

For a person anywhere at ground, the maximum RF exposure level due to the proposed Verizon operation is calculated to be 0.023 mW/cm<sup>2</sup>, which is 2.3% of the applicable public exposure limit. The maximum calculated level at the second-story elevation of any nearby building<sup>†</sup> is 7.4% of the public exposure limit. It should be noted that these results include several "worst-case" assumptions and therefore are expected to overstate actual power density levels from the proposed operation.

Assumed to be omnidirectional, although manufacturer's patterns show reduced power in certain directions.

Located at least 30 feet away, based on the drawings.

#### Verizon Wireless • Proposed Small Cell (No. 425102 "Sonoma 012") 25 McDonell Street • Sonoma, California

#### No Recommended Compliance Measures

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#### Conclusion

Based on the information and analysis above, it is the undersigned's professional opinion that operation of the small cell proposed by Verizon Wireless near 25 McDonell Street in Sonoma, California, will comply with the prevailing standards for limiting public exposure to radio frequency energy and, therefore, will not for this reason cause a significant impact on the environment. The highest calculated level in publicly accessible areas is much less than the prevailing standards allow for exposures of unlimited duration. This finding is consistent with measurements of actual exposure conditions taken at other operating small cells.

#### Authorship

The undersigned author of this statement is a qualified Professional Engineer, holding California Registration No. E-21306, which expires on September 30, 2019. This work has been carried out under his direction, and all statements are true and correct of his own knowledge except, where noted, when data has been supplied by others, which data he believes to be correct.



August 8, 2019

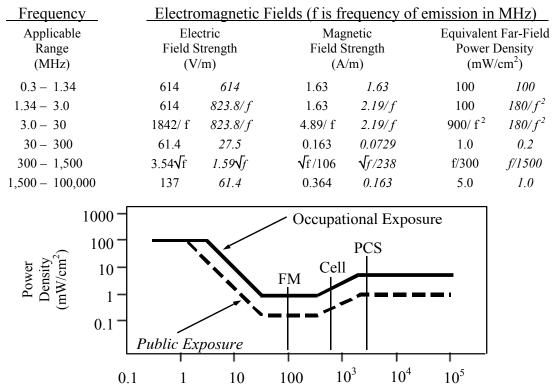


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As shown in the table and chart below, separate limits apply for occupational and public exposure conditions, with the latter limits (in *italics* and/or dashed) up to five times more restrictive:



Frequency (MHz)

Higher levels are allowed for short periods of time, such that total exposure levels averaged over six or thirty minutes, for occupational or public settings, respectively, do not exceed the limits, and higher levels also are allowed for exposures to small areas, such that the spatially averaged levels do not exceed the limits. However, neither of these allowances is incorporated in the conservative calculation formulas in the FCC Office of Engineering and Technology Bulletin No. 65 (August 1997) for projecting field levels. Hammett & Edison has built those formulas into a proprietary program that calculates, at each location on an arbitrary rectangular grid, the total expected power density from any number of individual radio sources. The program allows for the description of buildings and uneven terrain, if required to obtain more accurate projections.

# RFR.CALC<sup>™</sup> Calculation Methodology

#### Assessment by Calculation of Compliance with FCC Exposure Guidelines

The U.S. Congress required (1996 Telecom Act) the Federal Communications Commission ("FCC") to adopt a nationwide human exposure standard to ensure that its licensees do not, cumulatively, have a significant impact on the environment. The maximum permissible exposure limits adopted by the FCC (see Figure 1) apply for continuous exposures from all sources and are intended to provide a prudent margin of safety for all persons, regardless of age, gender, size, or health. Higher levels are allowed for short periods of time, such that total exposure levels averaged over six or thirty minutes, for occupational or public settings, respectively, do not exceed the limits.

#### Near Field.

Prediction methods have been developed for the near field zone of panel (directional) and whip (omnidirectional) antennas, typical at wireless telecommunications base stations, as well as dish (aperture) antennas, typically used for microwave links. The antenna patterns are not fully formed in the near field at these antennas, and the FCC Office of Engineering and Technology Bulletin No. 65 (August 1997) gives suitable formulas for calculating power density within such zones.

For a panel or whip antenna, power density  $S = \frac{180}{\theta_{BW}} \times \frac{0.1 \times P_{net}}{\pi \times D \times h}$ , in mW/cm<sup>2</sup>,

and for an aperture antenna, maximum power density  $S_{max} = \frac{0.1 \times 16 \times \eta \times P_{net}}{\pi \times h^2}$ , in mW/cm<sup>2</sup>,

where  $\theta_{BW}$  = half-power beamwidth of antenna, in degrees,

 $P_{net}$  = net power input to antenna, in watts,

D = distance from antenna, in meters,

h = aperture height of antenna, in meters, and

 $\eta$  = aperture efficiency (unitless, typically 0.5-0.8).

The factor of 0.1 in the numerators converts to the desired units of power density.

#### Far Field.

OET-65 gives this formula for calculating power density in the far field of an individual RF source:

power density 
$$\mathbf{S} = \frac{2.56 \times 1.64 \times 100 \times \mathrm{RFF}^2 \times \mathrm{ERP}}{4 \times \pi \times \mathrm{D}^2}$$
, in mW/cm<sup>2</sup>,

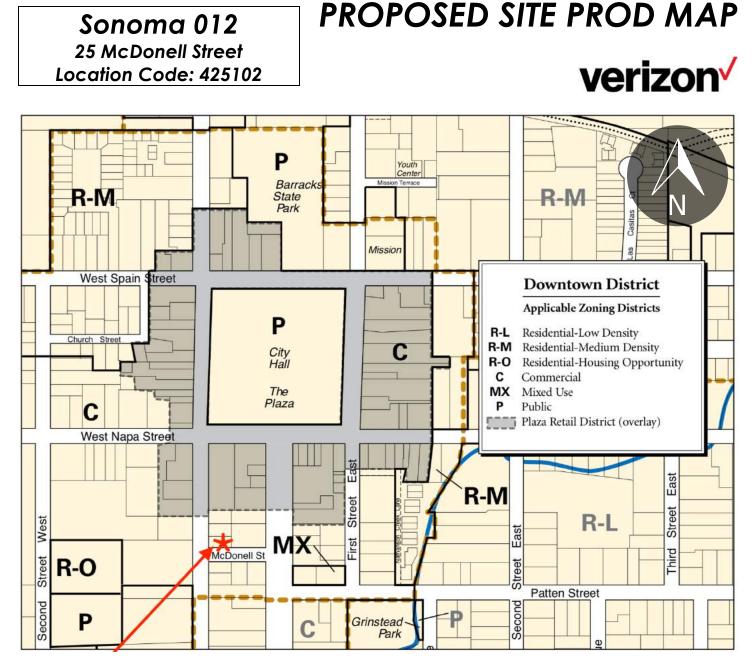
where ERP = total ERP (all polarizations), in kilowatts,

RFF = three-dimensional relative field factor toward point of calculation, and

D = distance from antenna effective height to point of calculation, in meters.

The factor of 2.56 accounts for the increase in power density due to ground reflection, assuming a reflection coefficient of 1.6 ( $1.6 \times 1.6 = 2.56$ ). The factor of 1.64 is the gain of a half-wave dipole relative to an isotropic radiator. The factor of 100 in the numerator converts to the desired units of power density. This formula is used in a computer program capable of calculating, at thousands of locations on an arbitrary grid, the total expected power density from any number of individual radio frequency sources. The program also allows for the inclusion of uneven terrain in the vicinity, as well as any number of nearby buildings, to obtain more accurate projections.





SITE COORDINATES LATITUDE: 38.290539 LONGITUDE: -122.458803 The proposed street light utility pole location for Sonoma 012 is located in the Commercial District and will not impact the Plaza Retail Overlay District. An added street light utility pole, in this location, would be an asset to the community and surrounding business by creating more safety and visibility, lighting the sidewalks and driveways for residents using the nearby facilities.

### SONOMA 012

25 McDonell Street Sonoma, CA 95476 Location Code: 425102



The CBR Group 2840 Howe Rd., Suite E Martinez, CA 94553 info@thecbrgroup.com