WATERFORD

Radio Frequency Emissions Compliance Report for Verizon Wireless

Site Name:	**YOLANDA AVE**	**Site Structure Type:**	**Monopine**
Address:	**244 Colgan Avenue**	**Latitude:**	**38.420864**
	Santa Rosa CA, 95404	**Longitude:**	**-122.711361**
Report Date:	**May 24, 2023**	**Project:**	**New Build**

Compliance Statement

Based on information provided by Verizon Wireless and predictive modeling, the YOLANDA AVE installation proposed by Verizon Wireless will be compliant with Radiofrequency Radiation Exposure Limits of 47 C.F.R. §§ 1.1307(b)(3) and 1.1310. The proposed operation will not expose members of the General Public to hazardous levels of RF energy at ground level or in adjacent buildings. As predicted RF power densities will not exceed the FCC General Population limits, no mitigation action other than restricting access to the tower is required to achieve or maintain compliance.

Certification

I, David H. Kiser, am the reviewer and approver of this report and am fully aware of and familiar with the Rules and Regulations of both the Federal Communications Commissions (FCC) and the Occupational Safety and Health Administration (OSHA) with regard to Human Exposure to Radio Frequency Radiation, specifically in accordance with FCC's OET Bulletin 65. I have reviewed this Radio Frequency Exposure Assessment report and believe it to be both true and accurate to the best of my knowledge.

REGISTERED PROFESSIONAL ENGINEER DAVID H. KISER NO. 21542 ELECTRICAL STATE OF CALIFORNIA

David H. Kiser, P.E.
Registered Professional Engineer (Electrical)
State of California, 21542, Expires 6/30/2024
Date: 2023-May-25

General Summary

The compliance framework is derived from the Federal Communications Commission (FCC) Rules and Regulations for preventing human exposure in excess of the applicable Maximum Permissible Exposure ("MPE") limits. At any location at this site, the power density resulting from each transmitter may be expressed as a percentage of the frequency-specific limits and added to determine if 100% of the exposure limit has been exceeded. The FCC Rules define two tiers of permissible exposure differentiated by the situation in which the exposure takes place and/or the status of the individuals who are subject to exposure. General Population / Uncontrolled exposure limits apply to those situations in which persons may not be aware of the presence of electromagnetic energy, where exposure is not employment-related, or where persons cannot exercise control over their exposure. Occupational / Controlled exposure limits apply to situations in which persons are exposed as a consequence of their employment, have been made fully aware of the potential for exposure, and can exercise control over their exposure. Based on the criteria for these classifications, the FCC General Population limit is considered to be a level that is safe for continuous exposure time. The FCC General Population limit is 5 times more restrictive than the Occupational limits.

In situations where the predicted MPE exceeds the General Population threshold in an accessible area as a result of emissions from multiple transmitters, FCC licensees that contribute greater than 5% of the aggregate MPE share responsibility for mitigation.

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Table 1: FCC Limits

Frequency (MHz)	*Limits for General Population/ Uncontrolled Exposure*		*Limits for Occupational/ Controlled Exposure*	
	Power Density (mW/cm^2)	Averaging Time (minutes)	Power Density (mW/cm^2)	Averaging Time (minutes)
30-300	0.2	30	1	6
300-1500	f/1500	30	f/300	6
1500-100,000	1.0	30	5.0	6

f=Frequency (MHz)

Based on the computational guidelines set forth in FCC OET Bulletin 65, Waterford Consultants, LLC has developed software to predict the overall Maximum Permissible Exposure possible at any location given the spatial orientation and operating parameters of multiple RF sources. The power density in the Far Field of an RF source is specified by OET-65 Equation 5 as follows:

$$S = \frac{EIRP}{4 \cdot \pi \cdot R^2} \ (\mathrm{mW/cm^2})$$

where EIRP is the Effective Radiated Power relative to an isotropic antenna and R is the distance between the antenna and point of study. Additionally, consideration is given to the manufacturers' horizontal and vertical antenna patterns as well as radiation reflection. At any location, the predicted power density in the Far Field is the spatial average of points within a 0 to 6-foot vertical profile that a person would occupy. Near field power density is based on OET-65 Equation 20 stated as

$$S = \left(\frac{180}{\theta_{BW}}\right) \cdot \frac{100 \cdot P_{in}}{\pi \cdot R \cdot h} \ (\mathrm{mW/cm^2})$$

where P_{in} is the power input to the antenna, θ_{BW} is the horizontal pattern beamwidth and h is the aperture length.

Some antennas employ beamforming technology where RF energy allocated to each customer device is dynamically directed toward their location. In the analysis presented herein, predicted exposure levels are based on all beams at full utilization (i.e. full power) simultaneously focused in any direction. As this condition is unlikely to occur, the actual power density levels at ground and at adjacent structures are expected to be less that the levels reported below. These theoretical results represent maximum-case predictions as all RF emitters are assumed to be operating at 100% duty cycle.

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Analysis

Verizon Wireless proposes the following installation at this location:

- INSTALL (12) (N) ANTENNAS
- INSTALL (8) (N) RADIO UNITS @ ANTENNAS

The antennas will be mounted on a 64-foot Monopine with centerlines 52.9 & 65 feet above ground level. Proposed antenna operating parameters are listed in Appendix A. Other appurtenances such as GPS antennas, RRUs and hybrid cable below the antennas are not sources of RF emissions. No other antennas are known to be operating in the vicinity of this site.

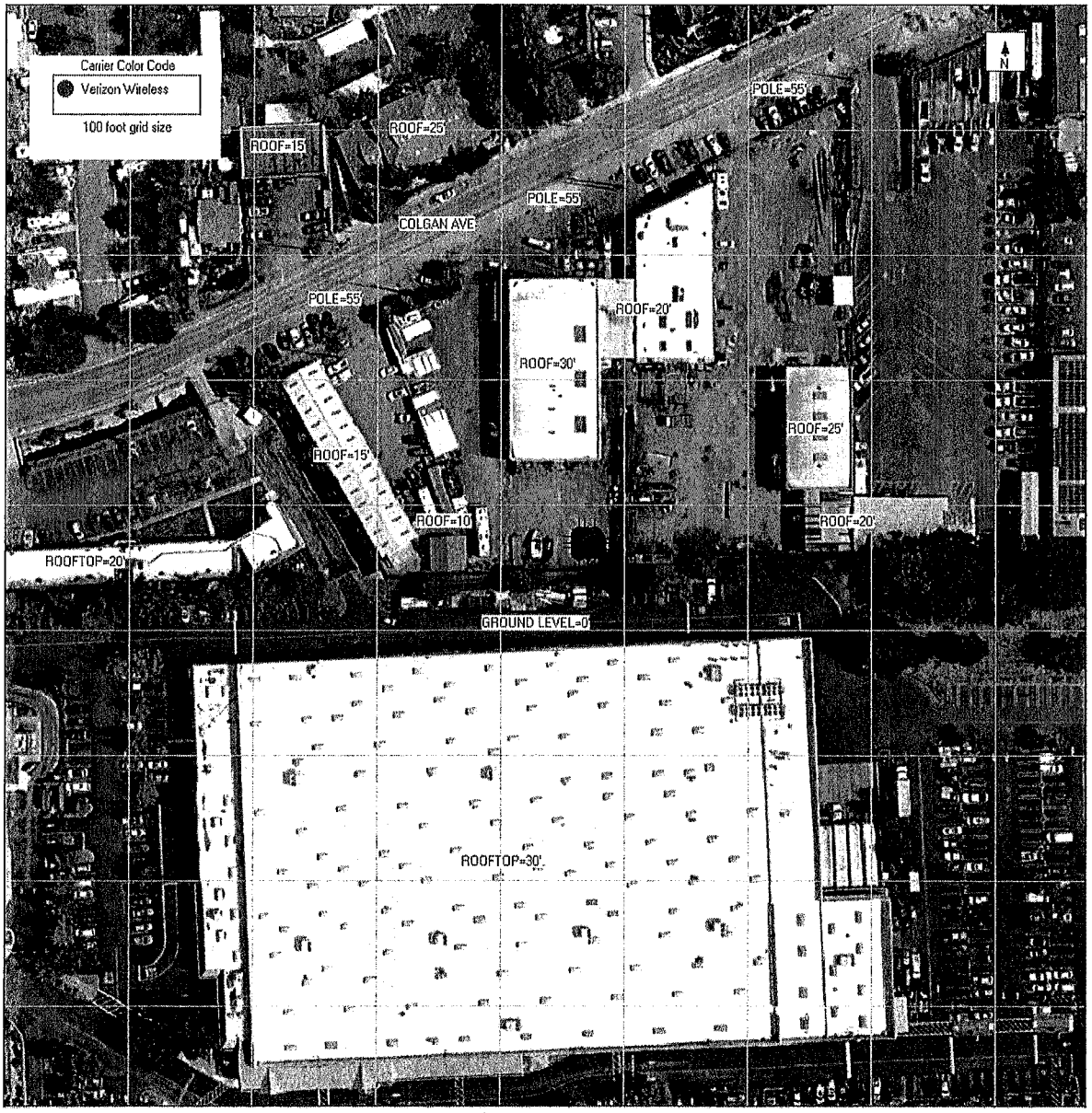

Figure 1: Antenna Locations

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Power density decreases significantly with distance from any antenna. The panel-type antennas to be employed at this site are highly directional by design and the orientation in azimuth and mounting elevation, as documented, serves to reduce the potential to exceed MPE limits at any location other than directly in front of the antennas. For accessible areas at ground level, the maximum predicted power density level resulting from all Verizon Wireless operations is 11.7934% of the FCC General Population limits. Incident at adjacent buildings depicted in Figure 1, the maximum predicted power density level resulting from all Verizon Wireless operations is 93.0289% of the FCC General Population limits. The proposed operation will not expose members of the General Public to hazardous levels of RF energy at ground level or in adjacent buildings. As predicted RF power densities will not exceed the FCC General Population limits, no mitigation action other than operating as depicted in Appendix A and restricting access to the tower is required to achieve or maintain compliance.

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Appendix A: Operating Parameters Considered in this Analysis

Antenna #:	Carrier:	Manufacturer	Pattern:	Band (MHz):	Mech Az (deg):	Mech DT (deg):	H BW (deg):	Length (ft):	TPO (W):	Channels:	Loss (dB):	Gain (dBd):	ERP (W):	EIRP (W):	Rad Center (ft):
1	Verizon	QUINTEL	QS6456-5 V3 02DT	700	0	0	49	6	60	2	0	13.05	2422	3974	65
1	Verizon	QUINTEL	QS6456-5 V3 02DT	850	0	0	46	6	60	2	0	13.05	2422	3974	65
1	Verizon	QUINTEL	QS6456-5 V3 00DT	1900	0	0	44	6	60	4	0	16.35	10356	16991	65
2	Verizon	QUINTEL	QS6456-5 V3 02DT	700	0	0	49	6	60	2	0	13.05	2422	3974	65
2	Verizon	QUINTEL	QS6456-5 V3 02DT	850	0	0	46	6	60	2	0	13.05	2422	3974	65
2	Verizon	QUINTEL	QS6456-5 V3 00DT	2100	0	0	43	6	30	4	0	16.35	5178	8495	65
2	Verizon	QUINTEL	QS6456-5 V3 00DT	2100	0	0	43	6	30	4	0	16.35	5178	8495	65
3	Verizon	ERICSSON	SON_AIR6449 NR TB 03.24.21 3700 VZW	3700	0	0	11	2.8	320	1	3	23.55	36320	59587	65
4	Verizon	QUINTEL	QS6456-5 V3 02DT	700	90	0	49	6	60	2	0	13.05	2422	3974	65
4	Verizon	QUINTEL	QS6456-5 V3 02DT	850	90	0	46	6	60	2	0	13.05	2422	3974	65
4	Verizon	QUINTEL	QS6456-5 V3 00DT	1900	90	0	44	6	60	4	0	16.35	10356	16991	65
5	Verizon	QUINTEL	QS6456-5 V3 02DT	700	90	0	49	6	60	2	0	13.05	2422	3974	65
5	Verizon	QUINTEL	QS6456-5 V3 02DT	850	90	0	46	6	60	2	0	13.05	2422	3974	65
5	Verizon	QUINTEL	QS6456-5 V3 00DT	2100	90	0	43	6	30	4	0	16.35	5178	8495	65
5	Verizon	QUINTEL	QS6456-5 V3 00DT	2100	90	0	43	6	30	4	0	16.35	5178	8495	65
6	Verizon	ERICSSON	SON_AIR6449 NR TB 03.24.21 3700 VZW	3700	90	0	11	2.8	320	1	0	23.55	72469	118891	65
7	Verizon	QUINTEL	QS6456-5 V3 02DT	700	180	0	49	6	60	2	0	13.05	2422	3974	65
7	Verizon	QUINTEL	QS6456-5 V3 02DT	850	180	0	46	6	60	2	0	13.05	2422	3974	65
7	Verizon	QUINTEL	QS6456-5 V3 00DT	1900	180	0	44	6	60	4	0	16.35	10356	16991	65
8	Verizon	QUINTEL	QS6456-5 V3 02DT	700	180	0	49	6	60	2	0	13.05	2422	3974	65
8	Verizon	QUINTEL	QS6456-5 V3 02DT	850	180	0	46	6	60	2	0	13.05	2422	3974	65
8	Verizon	QUINTEL	QS6456-5 V3 00DT	2100	180	0	43	6	30	4	0	16.35	5178	8495	65
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9	Verizon	ERICSSON	SON_AIR6449 NR TB 03.24.21 3700 VZW	3700	180	0	11	2.8	320	1	3	23.55	36320	59587	65
10	Verizon	QUINTEL	QS6456-5 V3 02DT	700	270	0	49	6	60	2	0	13.05	2422	3974	65
10	Verizon	QUINTEL	QS6456-5 V3 02DT	850	270	0	46	6	60	2	0	13.05	2422	3974	65
10	Verizon	QUINTEL	QS6456-5 V3 00DT	1900	270	0	44	6	60	4	0	16.35	10356	16991	65
11	Verizon	QUINTEL	QS6456-5 V3 02DT	700	270	0	49	6	60	2	0	13.05	2422	3974	65
11	Verizon	QUINTEL	QS6456-5 V3 02DT	850	270	0	46	6	60	2	0	13.05	2422	3974	65
11	Verizon	QUINTEL	QS6456-5 V3 00DT	2100	270	0	43	6	30	4	0	16.35	5178	8495	65
11	Verizon	QUINTEL	QS6456-5 V3 00DT	2100	270	0	43	6	30	4	0	16.35	5178	8495	65
12	Verizon	ERICSSON	SON_AIR6449 NR TB 03.24.21 3700 VZW	3700	270	0	11	2.8	320	1	0	23.55	72469	118891	65
13	Verizon	ANDREW	VHLP4-11	11000	0	0	1.5	4	0.2	1	0	38.7	1483	2432	52.9

Notes: Table depicts recommended operating parameters for Verizon Wireless proposed operations.

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