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**Evaluation of Compliance with FCC Guidelines for
Human Exposure to Radiofrequency Radiation**

Site Address:

**10365 172nd Ave NE
Redmond, WA 98052**

Site Name:

**Puget Sound Emergency Radio Network
Education Hill**

Prepared for:

Odelia Pacific Corp.

August 15, 2016

Prepared By:

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Introduction

This report details the results of the ground level analysis of the emissions created by the antennas located on a Puget Sound Emergency Radio Network (PSERN) Education Hill site at 10365 172nd Ave NE, Redmond WA 98052. In addition to the exposures from the proposed PSERN transmitters, Sprint, AT&T, Verizon and T-Mobile have antennas located on nearby water towers on the same property. The contributions from all emitters are considered in calculating the Maximum Permissible Exposure (MPE) from the proposed facility.

Summary of Findings

Based on a calculation specified by the Federal Communication Commission, the maximum level of public exposure to RF signal from the proposed antennas will be a fraction of FCC exposure limits. Specifically, the proposed antennas and the existing contributions from the cellular carriers will contribute less than 2% of the FCC general population exposure limit (emissions standard).

Technical Data

This report is based on engineering data for the project provided by S. Douglas, King County IT on June 30th, 2016. The proposed facility consists of a Sinclair SC412-HF2LDF¹ collinear omni antenna at 140' and a Sinclair enclosed dipole antenna SC419-HF2LDF². Two microwave antennas are also placed on this tower, one at 168' with an azimuth at 312° and another at 155' with an azimuth at 93°. The power level and antenna type for the microwave antennas was not available so the Commscope HPX4-107-P3AB and the Commscope VHLP-3-11W-6WA was used based upon previous usage of the antennas on other PSERN sites. The input power for the microwave antennas was assumed to be 1 W with the respective gains included in the EIRP calculations.

The AT&T emissions data was provided by R. Maheshwari, AT&T RF engineer on 8/5/2016. The T-Mobile emissions data was provided by D. Burgos, T-Mobile RF engineer on 8/5/2016. The Verizon emissions was supplied by K. Taylor on 8/12/16. Sprint data was not available so the antennas and power levels used at another Sprint facility was used for the calculations.

There exist several PSERN antennas on the water towers that will be decommissioned when the new monopole is built, as a result they were not included in the analysis. Further, a HAM radio antenna system exists on the site but from discussions with D. Reeve of the Redmond water district, the HAM radio system is no longer operational and was not included in the analysis.

¹ The pattern file for this antenna was not available, SC412-HP2LDF_807 was used instead.

² The pattern for this antenna was not available, SE419-SWBP2LDF_853 was used instead.

Basis of Calculations

Equation 6 of OET Bulletin 65³ is used as the basis for the calculations as it considers a truly upper limit prediction of power density in an outdoor environment in which 100% of incoming radiation is assumed to reflect off a ground surface, resulting in a doubling of the predicted field strength and a four fold increase in power density. The signal levels inside buildings will be substantially lower than those calculated using the FCC model because of the substantial absorption of RF energy by building materials.

The calculation used the formula from OET Bulletin 65:

$$S = [EIRP] / [\pi \cdot D^2]$$

WHERE:

S = Power density (mW/cm²)

EIRP = Effective isotropic radiated power (mW).

D = Hypotenuse distance (cm)

The EIRP varies with direction with respect to the main beam due to the antenna beam pattern. For the calculations presented here, the beam pattern was obtained from the manufacturer of the antenna. In instances where the exact radiation pattern envelope was not available, professional judgment was used and a suitable replacement antenna's characteristics were substituted.

Ground Level Exposures

Table 1 shows the calculated Maximum Permissible Exposure (MPE) at 6' above ground level at ~330' assuming all antennas operating at 100% and complete ground reflection. The predicted maximum exposure toward the south is 0.015 mW/cm² or 1.96% of the FCC general public exposure limit. Table 1 also provides the combined input power for each frequency band. From Table 1 it can be seen that the proposed Sinclair antenna contribute little to the existing radio frequency background in the nearby community. The heavy tree canopy surrounding the facility make it unlikely that the predicted maximum exposure would occur due to the attenuation of the RF signal through the trees.

³ Federal Communications Commission Office of Engineering and Technology. Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields. OET Bulletin 65. 1997.

Table 1: Calculated Ground Level Power Density						
Site Name:	PSERN Education Hill					
Location						
Carrier Type		Worst Case ERP (dBm)	Antenna Height (ft)	Maximum outdoor exposure @330' (with ground reflection) (mW/cm ²)	% of Standard	General Population Exposure Limit (mW/cm ²)
Sinclair SC412-HF2LDF	540	57.32	140	5.96E-06	0.00%	0.533
Sinclair SE419-SF3PALDF	540	57.32	140	1.24E-05	0.00%	0.533
Sprint 2500	305	54.84	76	4.39E-06	0.00%	1.000
Sprint 1950	807	59.07	76	1.16E-05	0.00%	1.000
Sprint 860	486	56.87	76	3.12E-04	0.06%	0.567
ATT UMTS 850	992	59.97	76.9	2.11E-03	0.37%	0.567
ATT UMTS 1900	879	59.44	76.9	1.35E-03	0.14%	1.000
ATT LTE 700	615	57.89	76.9	1.12E-03	0.22%	0.500
T-Mobile PCS	3279	65.16	76	4.30E-03	0.43%	1.000
T-Mobile UMTS AWS	834	59.21	76	1.64E-04	0.02%	1.000
T-Mobile LTE AWS	3264	65.14	76	4.38E-03	0.44%	1.000
11 GHz Microwave antenna	1221	60.87	168	0.00E+00	0.00%	1.000
Verizon 750	1067	60.28	74	1.21E-03	0.24%	0.500
Verizon PCS	2589	64.13	74	2.92E-04	0.03%	1.000
Verizon AWS	3260	65.13	74	1.40E-04	0.01%	1.000
			Total	1.54E-02	1.96%	

Discussion

The RF signal levels from the proposed installation will be a tiny fraction of FCC exposure limits at any place of public access, and from the point of view of FCC exposure limits are entirely negligible.

The biological effects of RF energy have been extensively studied, and there are several thousand reports in the scientific literature on this subject. These reports have been critically reviewed by numerous independent panels, most recently the IEEE (formerly Institute of Electrical and Electronics Engineers) and the International Commission on Nonionizing Radiation Protection. These groups have affirmed existing health standards, or have developed and proposed standards for exposure to RF energy that are broadly similar to the FCC limits.

For further information The Federal Communications Commission (FCC) maintains a World Wide Web site at <http://www.fcc.gov>. A general information sheet about possible health and safety issues regarding radiofrequency energy is at: <http://www.fcc.gov/oet/rfsafety/cellpcs.html>.

Conclusions/Recommendations

The maximum ground level predicted exposure is 0.0154 mW/cm² or 1.96% of the FCC general public exposure limit at a location ~330 feet (horizontally) from the proposed tower.

Certification

I hereby certify the following:

1. I have read and fully understand the FCC regulations concerning RF safety and the control of human exposure to RF fields.
2. To the best of my knowledge, the statements and information disclosed in this report are true, complete and accurate, based on engineering design data for the site supplied by the King County, AT&T, Verizon and T-Mobile.
3. The results of the analysis indicate that the site is in full compliance with the FCC regulations concerning RF exposure.

Regards,

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