

Radio Frequency- Electromagnetic Energy (RF-EME) Compliance Report

Site No. 205061
Brookdale
715 Graham Hill Road
Santa Cruz, California 95060
Santa Cruz County
37.100000; -122.033308 NAD83

EBI Project No. 62131772
February 4, 2013



Prepared for:
Verizon Wireless
c/o Core Development Services
2903 Saturn Street, Suite H
Brea, California 92821

Prepared by:
 **EBI Consulting**
environmental | engineering | due diligence

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EXECUTIVE SUMMARY

Purpose of Report

EnviroBusiness Inc. (dba EBI Consulting) has been contracted by Verizon Wireless to conduct radio frequency electromagnetic (RF-EME) modeling for Verizon Site 205061 located at 715 Graham Hill Road in Santa Cruz, California to determine RF-EME exposure levels from proposed Verizon wireless communications equipment at this site. As described in greater detail in Section 2.0 of this report, the Federal Communications Commission (FCC) has developed Maximum Permissible Exposure (MPE) Limits for general public exposures and occupational exposures. This report summarizes the results of RF-EME modeling in relation to relevant FCC RF-EME compliance standards for limiting human exposure to RF-EME fields.

Statement of Compliance

A site is considered out of compliance with FCC regulations if there are areas that exceed the FCC exposure limits and there are no RF hazard mitigation measures in place. Any carrier which has an installation that contributes more than 5% of the applicable MPE must participate in mitigating these RF hazards.

As presented in the sections below, based on worst-case predictive modeling, there are no modeled areas on any accessible ground-level walking/working surface related to the proposed antennas that exceed the FCC's occupational or general public exposure limits at this site.

Recommended control measures are outlined in Section 5.0 and within a Site Safety Plan (attached); this plan includes instructions to shut down and lockout/tagout this wireless equipment in accordance with Verizon's standard operating protocol.

1.0 INTRODUCTION

Radio frequency waves are electromagnetic waves from the portion of the electromagnetic spectrum at frequencies lower than visible light and microwaves. The wavelengths of radio waves range from thousands of meters to around 30 centimeters. These wavelengths correspond to frequencies as low as 3 cycles per seconds (or hertz [Hz]) to as high as one gigahertz (one billion cycles per second).

Personal Communication (PCS) facilities used by Verizon in this area operate within a frequency range of 700-2100 MHz. Facilities typically consist of: 1) electronic transceivers (the radios or cabinets) connected to wired telephone lines; and 2) antennas that send the wireless signals created by the transceivers to be received by individual subscriber units (PCS telephones). Transceivers are typically connected to antennas by coaxial cables.

Because of the short wavelength of PCS services, the antennas require line-of-site paths for good propagation, and are typically installed a distance above ground level. Antennas are constructed to concentrate energy towards the horizon, with as little energy as possible scattered towards the ground or the sky. This design, combined with the low power of PCS facilities, generally results in no possibility for exposure to approach Maximum Permissible Exposure (MPE) levels, with the exception of in areas in the immediate vicinity of the antennas.

MPE limits do not represent levels where a health risk exists, since they are designed to provide a substantial margin of safety. 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.

2.0 SITE DESCRIPTION

This project site includes nine (9) wireless telecommunication antennas (at three sector locations) on a monotree located at 715 Graham Hill Road in Santa Cruz, California.

Verizon Antenna Information (proposed Configuration)									
Antenna# and Model	Frequency (MHz)	# of Transmitters	Transmit Power (Watts)	Azimuth	Gain (dBd)	Feet above Ground (CL)	X	Y	Z
A1 Andrews LNX-6514DS-VTM	850	8	20	60°	14.15	43 ft AGL	12	14	43
A2 Andrews HBXX-6517DS-VTM	1900 2100	3 1	16 40	60°	16.95 17.05	38 ft AGL	13	13	38
A3 Andrews LNX-6514DS-VTM	700	1	40	60°	13.55	38 ft AGL	13	11	38

BI Andrews LNX- 6514DS- VTM	850	8	20	180°	14.15	43 ft AGL	12	10	43
B2 Andrews HBXX- 6517DS- VTM	1900 2100	3 1	16 40	180°	16.95 17.05	38 ft AGL	10	11	38
B3 Andrews LNX- 6514DS- VTM	700	1	40	180°	13.55	38 ft AGL	8	11	38
CI Andrews LNX- 6514DS- VTM	850	8	20	305°	14.15	43 ft AGL	8	13	43
C2 Andrews HBXX- 6517DS- VTM	1900 2100	3 1	16 40	305°	16.95 17.05	38 ft AGL	9	14	38
C3 Andrews LNX- 6514DS- VTM	700	1	40	305°	13.55	38 ft AGL	11	15	38

The FCC guidelines incorporate two separate tiers of exposure limits that are based upon occupational/controlled exposure limits (for workers) and general population/uncontrolled exposure limits for members of the general public that may be exposed to antenna fields. While access to this site is considered controlled, the analysis has considered exposures with respect to both controlled and uncontrolled limits as an untrained worker may access adjacent rooftop locations. Additional information regarding controlled/uncontrolled exposure limits is provided in Section 3.0. Appendix B presents a site safety plan that provides a plan view of the monotree with antenna locations.

3.0 FEDERAL COMMUNICATIONS COMMISSION (FCC) REQUIREMENTS

The FCC has established Maximum Permissible Exposure (MPE) limits for human exposure to Radiofrequency Electromagnetic (RF-EME) energy fields, based on exposure limits recommended by the National Council on Radiation Protection and Measurements (NCRP) and, over a wide range of

frequencies, the exposure limits developed by the Institute of Electrical and Electronics Engineers, Inc. (IEEE) and adopted by the American National Standards Institute (ANSI) to replace the 1982 ANSI guidelines. Limits for localized absorption are based on recommendations of both ANSI/IEEE and NCRP.

The FCC guidelines incorporate two separate tiers of exposure limits that are based upon occupational/controlled exposure limits (for workers) and general public/uncontrolled exposure limits for members of the general public.

Occupational/controlled exposure limits apply to situations in which persons are exposed as a consequence of their employment and in which those persons who are exposed have been made fully aware of the potential for exposure and can exercise control over their exposure. Occupational/controlled exposure limits also apply where exposure is of a transient nature as a result of incidental passage through a location where exposure levels may be above general public/uncontrolled limits (see below), as long as the exposed person has been made fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means.

General public/uncontrolled exposure limits apply to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Therefore, members of the general public would always be considered under this category when exposure is not employment-related, for example, in the case of a telecommunications tower that exposes persons in a nearby residential area.

Table I and Figure I (below), which are included within the FCC’s OET Bulletin 65, summarize the MPE limits for RF emissions. These limits are designed to provide a substantial margin of safety. They vary by frequency to take into account the different types of equipment that may be in operation at a particular facility and are “time-averaged” limits to reflect different durations resulting from controlled and uncontrolled exposures.

The FCC’s MPEs are measured in terms of power (mW) over a unit surface area (cm²). Known as the power density, the FCC has established an occupational MPE of 5 milliwatts per square centimeter (mW/cm²) and an uncontrolled MPE of 1 mW/cm² for equipment operating in the 1900 MHz frequency range. For the Verizon equipment operating at 700 MHz or 850 MHz, the FCC’s occupational MPE is 2.83 mW/cm² and an uncontrolled MPE of 0.57 mW/cm². These limits are considered protective of these populations.

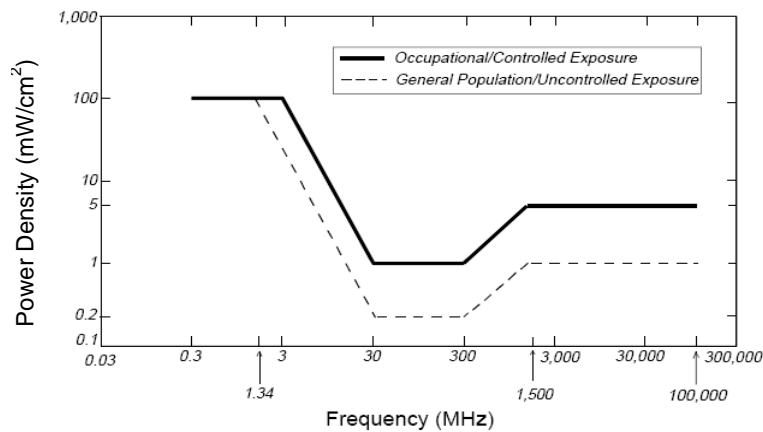
Table I: Limits for Maximum Permissible Exposure (MPE)				
(A) Limits for Occupational/Controlled Exposure				
Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm ²)	Averaging Time [E] ² , [H] ² , or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842/f	4.89/f	(900/f ²)*	6
30-300	61.4	0.163	1.0	6
300-1,500	--	--	f/300	6
1,500-100,000	--	--	5	6

(B) Limits for General Public/Uncontrolled Exposure				
Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm²)	Averaging Time [E]², [H]², or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f ²)*	30
30-300	27.5	0.073	0.2	30
300-1,500	--	--	f/1,500	30
1,500-100,000	--	--	1.0	30

f = Frequency in (MHz)

* Plane-wave equivalent power density

Figure 1. FCC Limits for Maximum Permissible Exposure (MPE)
 Plane-wave Equivalent Power Density



Based on the above, the most restrictive thresholds for exposures of unlimited duration to RF energy for several personal wireless services are summarized below:

Personal Wireless Service	Approximate Frequency	Occupational MPE	Public MPE
Personal Communication (PCS)	1,950 MHz	5.00 mW/cm ²	1.00 mW/cm ²
Cellular Telephone	870 MHz	2.90 mW/cm ²	0.58 mW/cm ²
Specialized Mobile Radio	855 MHz	2.85 mW/cm ²	0.57 mW/cm ²
Most Restrictive Freq, Range	30-300 MHz	1.00 mW/cm ²	0.20 mW/cm ²

MPE limits are designed to provide a substantial margin of safety. 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.

Personal Communication (PCS) facilities used by Verizon in this area operate within a frequency range of 700-2100 MHz. Facilities typically consist of: 1) electronic transceivers (the radios or cabinets) connected to wired telephone lines; and 2) antennas that send the wireless signals created by the transceivers to be received by individual subscriber units (PCS telephones). Transceivers are typically connected to antennas by coaxial cables.

Because of the short wavelength of PCS services, the antennas require line-of-site paths for good propagation, and are typically installed above ground level. Antennas are constructed to concentrate energy towards the horizon, with as little energy as possible scattered towards the ground or the sky.

This design, combined with the low power of PCS facilities, generally results in no possibility for exposure to approach Maximum Permissible Exposure (MPE) levels, with the exception of areas directly in front of the antennas.

4.0 WORST-CASE PREDICTIVE MODELING

EBI has performed theoretical modeling using RoofView® software to estimate the worst-case power density at the site ground-level resulting from operation of the antennas. RoofView® is a widely-used predictive modeling program that has been developed by Richard Tell Associates to predict both near field and far field RF power density values for roof-top and tower telecommunications sites produced by vertical collinear antennas that are typically used in the cellular, PCS, paging and other communications services. The models utilize several operational specifications for different types of antennas to produce a plot of spatially-averaged power densities that can be expressed as a percentage of the applicable exposure limit.

The modeling is based on worst-case assumptions for the number of antennas and transmitter power. The modeling assumes a maximum 13-13-13 radio configuration for Sectors A, B and C, with a power level of 43 dBm (20 watts) per transmitter for the 850 frequency, 46 dBm (40 watts) per transmitter for the 700 and 2100 frequencies, and 42 dBm (16 watts) per transmitter for the 1900 frequency, in order to provide a worst-case evaluation of predicted MPE levels. The assumptions used in the modeling are based upon information provided by Verizon, and information gathered from other sources. The parameters used for the modeling are summarized in the RoofView® export files presented in Appendix C.

There are no other wireless carriers with equipment installed at this site.

Based on worst-case predictive modeling, there are no modeled areas on any accessible ground-level walking/working surface related to the proposed Verizon antennas that exceed the FCC's occupational or general public exposure limits at this site.

At the nearest walking/working surfaces to the Verizon antennas, the maximum power density generated by the Verizon antennas is approximately 10.50 percent of the FCC's general public limit (2.10 percent of the FCC's occupational limit). The composite exposure level from all carriers on this site is approximately 10.50 percent of the FCC's general public limit (2.10 percent of the FCC's occupational limit) at the nearest walking/working surface to each antenna.

The Site Safety Plan also presents areas where Verizon Wireless antennas contribute greater than 5% of the applicable MPE limit for a site. A site is considered out of compliance with FCC regulations if there are areas that exceed the FCC exposure limits and there are no RF hazard mitigation measures in place. Any carrier which has an installation that contributes more than 5% of the applicable MPE must participate in mitigating these RF hazards.

The inputs used in the modeling are summarized in the RoofView® export file presented in Appendix C. A graphical representation of the RoofView® modeling results is presented in Appendix B. It should be noted that RoofView is not suitable for modeling microwave dish antennas; however, these units are designed for point-to-point operations at the elevations of the installed equipment rather than ground level coverage.

5.0 MITIGATION/SITE CONTROL OPTIONS

EBI's modeling indicates that there are no areas in front of the Verizon antennas that exceed the FCC standards for occupational or general public exposure. All exposures above the FCC's safe limits require that individuals be elevated above the ground. In order to alert people accessing the site, a NOC Information sign is recommended for installation at the access point to the monopole.

There are no barriers recommended on this site.

These protocols and recommended control measures have been summarized and included with a graphic representation of the antennas and associated signage and control areas in a RF-EME Site Safety Plan, which is included as Appendix B. Individuals and workers accessing the site should be provided with a copy of the attached Site Safety Plan, made aware of the posted signage, and signify their understanding of the Site Safety Plan.

Implementation of the signage recommended in the Site Safety Plan and in this report will bring this site into compliance with the FCC's rules and regulations.

6.0 SUMMARY AND CONCLUSIONS

EBI has prepared a Radiofrequency – Electromagnetic Energy (RF-EME) Compliance Report for telecommunications equipment installed by Verizon Site Number 205061 located at 715 Graham Hill Road in Santa Cruz, California to determine worst-case predicted RF-EME exposure levels from wireless communications equipment installed at this site. This report summarizes the results of RF-EME modeling in relation to relevant Federal Communications Commission (FCC) RF-EME compliance standards for limiting human exposure to RF-EME fields.

As presented in the sections above, based on the FCC criteria, there are no modeled areas on any accessible ground-level walking/working surface related to the proposed antennas that exceed the FCC's occupational or general public exposure limits at this site.

Workers should be informed about the presence and locations of antennas and their associated fields. Recommended control measures are outlined in Section 5.0 and within a Site Safety Plan (attached); this plan includes procedures to shut down and lockout/tagout this wireless equipment in accordance with Verizon's standard operating protocol.

7.0 LIMITATIONS

This report was prepared for the use of Verizon Wireless. It was performed in accordance with generally accepted practices of other consultants undertaking similar studies at the same time and in the same locale under like circumstances. The conclusions provided by EBI are based solely on the information provided by the client. The observations in this report are valid on the date of the investigation. Any additional information that becomes available concerning the site should be provided to EBI so that our conclusions may be revised and modified, if necessary. This report has been prepared in accordance with Standard Conditions for Engagement and authorized proposal, both of which are integral parts of this report. No other warranty, expressed or implied, is made.

Appendix A

Certifications

Reviewed and Approved by:



sealed 4feb2013

Michael McGuire
Electrical Engineer

Note that EBI's scope of work is limited to an evaluation of the Radio Frequency – Electromagnetic Energy (RF-EME) field generated by the antennas and broadcast equipment noted in this report. The engineering and design of the building and related structures, as well as the impact of the antennas and broadcast equipment on the structural integrity of the building, are specifically excluded from EBI's scope of work.

Preparer Certification

I, Christopher Ilgenfritz, state that:





- I am an employee of EnviroBusiness Inc. (d/b/a EBI Consulting), which provides RF-EME safety and compliance services to the wireless communications industry.
- I have successfully completed RF-EME safety training, and I am aware of the potential hazards from RF-EME and would be classified “occupational” under the FCC regulations.
- I am familiar with the FCC rules and regulations as well as OSHA regulations both in general and as they apply to RF-EME exposure.
- I have reviewed the data provided by the client and incorporated it into this Site Compliance Report such that the information contained in this report is true and accurate to the best of my knowledge.

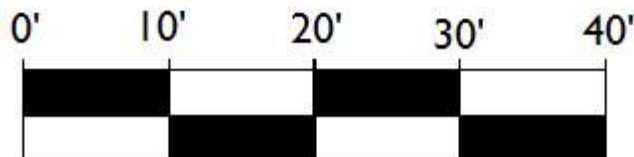
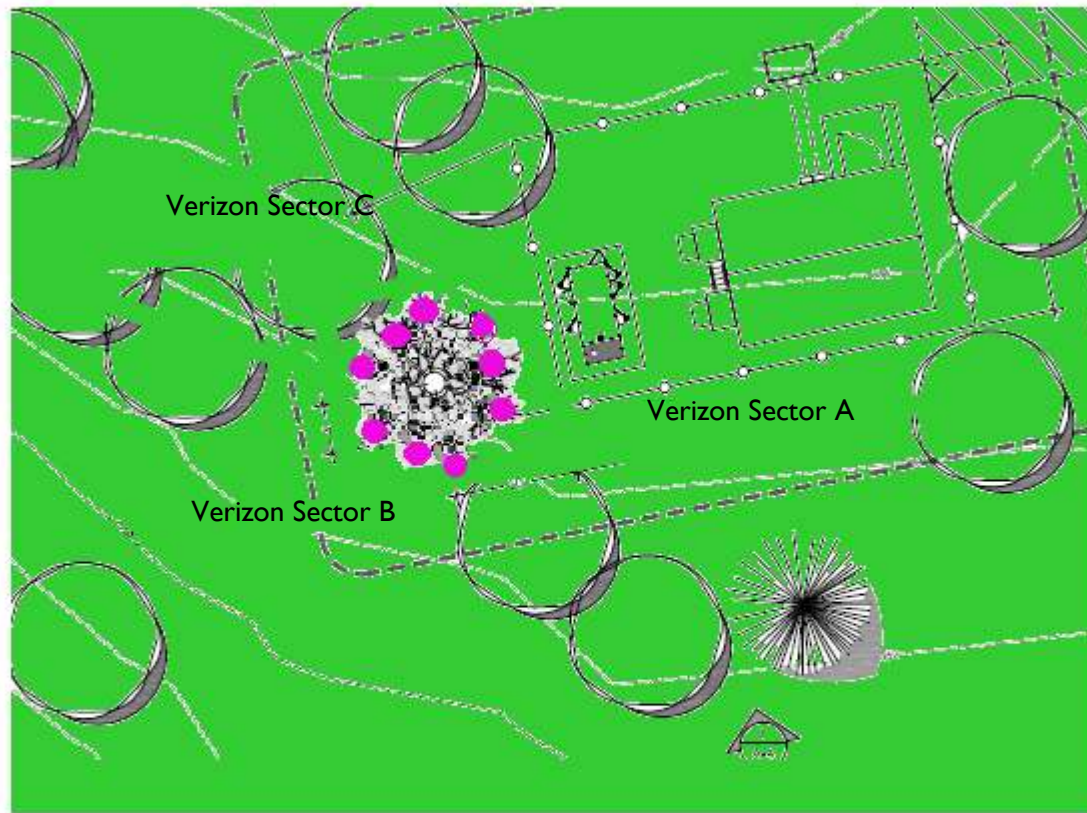


Appendix B



Radio Frequency Electromagnetic Energy Safety/ Signage Plans

% of FCC Public Exposure Limit

-  Exposure Level $\geq 5,000$
-  $500 < \text{Exposure Level} \leq 5000$
-  $100 < \text{Exposure Level} \leq 500$
-  Exposure Level ≤ 100



Legend

-  Verizon Antennas
-  Other Carrier Antennas

Roofview: Composite Exposure Levels



Facility Operator: Verizon Wireless

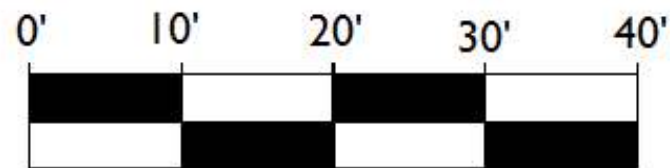
Site Name: Brookdale

Verizon Site Number: 205061


Report Date: 02-04-13

% of FCC Public Exposure Limit

-  Exposure Level >5
-  Exposure Level ≤ 5



Legend

-  Verizon Antennas
-  Other Carrier Antennas

Roofview: Verizon Exposure Levels

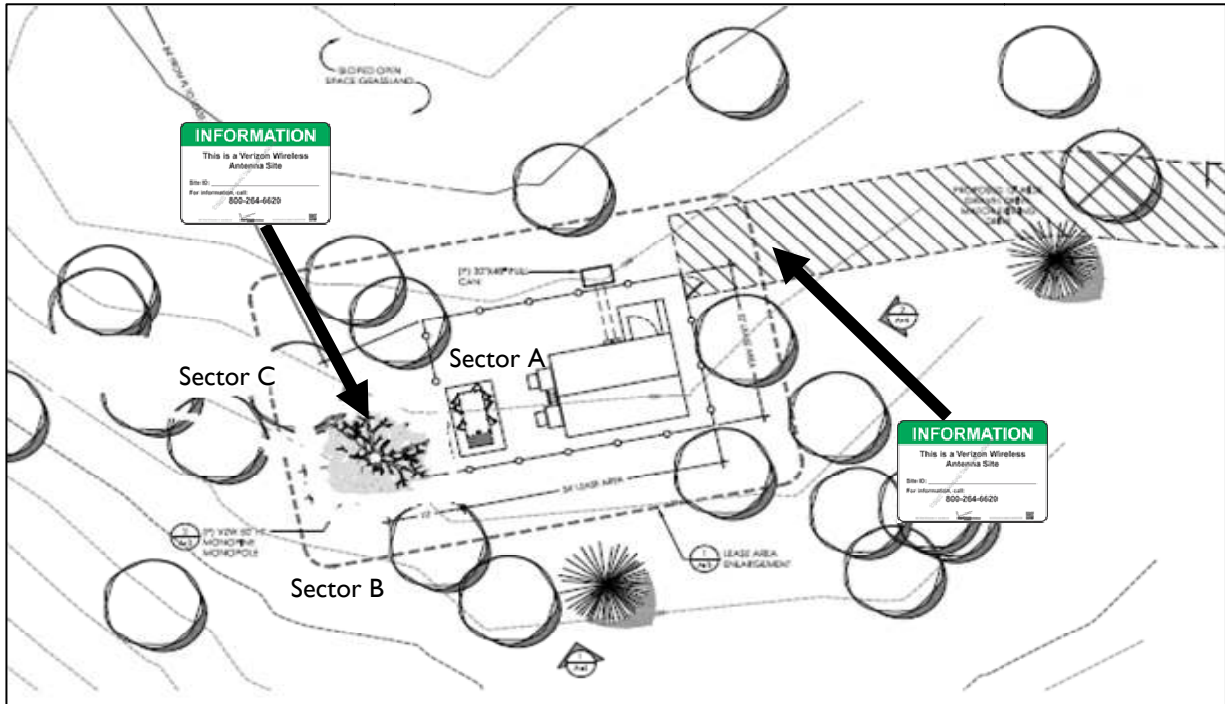
Facility Operator: Verizon Wireless


Site Name: Brookdale

Verizon Site Number: 205061


Report Date: 02-04-13

Verizon Signage Plan



Sign Image	Description	Posting Instructions
	<p>NOC Information Sign Informational sign with NOC Phone Number and Base Transceiver Station (BTS) Number</p>	<p>Securely post at every point of access to the site or at the base of the monotree if there is no compound.</p>

Signage Plan
Facility Operator: Verizon Wireless
Site Name: Brookdale
Verizon Site Number: 205061
Report Date: 02-04-13



Appendix C

Roofview® Export File

Map, Settings, Antenna, and Symbol Data Table .. Exported from workbook -> RoofView 4.15.xls
 Done on 1/29/2013 at 9:25:21 AM.

Use this format to prepare other data sets for the RoofView workbook file.
 You may use as many rows in this TOP header as you wish.

The critical point are the cells in COLUMN ONE that read 'Start...' (eg. StartMapDefinition)
 If used, these (4) headers are required to be spelled exactly, as one word (eg. StartMapDefinition)
 The very next row will be considered the start of that data block.

The first row of the data block can be a header (as shown below), but this is optional.

When building a text file for import, Add the Map info first, then the Antenna data, followed by the symbol data.
 All rows above the first marker line 'Start...' will be ignored, no matter how many there are.

This area is for you use for documentation.

End of help comments.

You can place as much text here as you wish as long as you don't place it below
 the Start Map Definition row below the blue line.

You may insert more rows using the Insert menu.

Should you need additional lines to document your project, simply insert additional rows
 by highlighting the row number adjacent to the blue line below and then clicking on the Insert menu
 and selecting rows.

StartMapDefinition

Roof Max Y Roof Max X Map Max Y Map Max X Y Offset X Offset mber of Ar envelope
 210 210 210 210 0 0 1 :\$11:\$HL\$2:\$11:\$HL\$220

StartSettingsData

Standard Method Uptime Scale Factor Low Thr Low Color Mid Thr Mid Color Hi Thr Hi Color Over Color Ap Ht Mult p Ht Method
 4 2 1 1 100 1 500 2 5000 3 3 1.5 1

StartAntennaData

able to provide an ID (ant 1) for all antennas														List Of Areas \$K\$11:\$HL\$220						
ID	Name	Freq	Power	Count	Coax Len	Coax Type	Other Loss	Input Power	Calc Power	Mfg	Model	(ft) X	(ft) Y	(ft) Z	Type	(ft) Aper	dBd Gain	BWdth Pt Dir	Uptime Profile	ON flag
VZW A1	Verizon	850	20	8					160	Andrew	LNx-6514DS-VTM	12	14	40		6	13.8	65;60		ON•
VZW A2	Verizon	1900	16	3					48	Andrew	HBXX-6517DS-VTM	13	13	34.875		6.25	16.5	65;60		ON•
VZW A2	Verizon	2100	40	1					40	Andrew	HBXX-6517DS-VTM	13	13	34.875		6.25	16.7	65;60		ON•
VZW A3	Verizon	700	40	1					40	Andrew	LNx-6514DS-VTM	13	11	35		6	13.2	65;60		ON•
VZW B1	Verizon	850	20	8					160	Andrew	LNx-6514DS-VTM	12	10	40		6	13.8	65;180		ON•
VZW B2	Verizon	1900	16	3					48	Andrew	HBXX-6517DS-VTM	10	11	34.875		6.25	16.5	65;180		ON•
VZW B2	Verizon	2100	40	1					40	Andrew	HBXX-6517DS-VTM	10	11	34.875		6.25	16.7	65;180		ON•
VZW B3	Verizon	700	40	1					40	Andrew	LNx-6514DS-VTM	8	11	35		6	13.2	65;180		ON•
VZW C1	Verizon	850	20	8					160	Andrew	LNx-6514DS-VTM	8	13	40		6	13.8	65;305		ON•
VZW C2	Verizon	1900	16	3					48	Andrew	HBXX-6517DS-VTM	9	14	34.875		6.25	16.5	65;305		ON•
VZW C2	Verizon	2100	40	1					40	Andrew	HBXX-6517DS-VTM	9	14	34.875		6.25	16.7	65;305		ON•
VZW C3	Verizon	700	40	1					40	Andrew	LNx-6514DS-VTM	11	15	35		6	13.2	65;305		ON•

StartSymbolData

Sym	Map Marke	Roof X	Roof Y	Map Label notes for this table only)
Sym		5	35	AC Unit mple symbols
Sym		14	5	Roof Access
Sym		45	5	AC Unit
Sym		45	20	Ladder