Global RF Solutions℠
RF Engineering Consultants
"Serving The Wireless Industries Needs"

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Evaluation of Human Exposure to Radio Frequency Emissions

Preliminary Analysis of PHO - Carribean
Scottsdale, AZ

LIMITED WARRANTY

Global RF Solutions warrants that this analysis was performed using substantially the methods that are referenced and described in this report and based entirely upon the information on the antenna site that was provided by Verizon Wireless. Global RF Solutions disclaims all other warranties either expressed or implied, including, but not limited to, implied warranties of merchantability and fitness for a particular purpose.

In no event will Global RF Solutions be liable to you or by any other person for damages, including any loss of profits, lost savings, or other special, exemplary, punitive, incidental or consequential damages arising out of your use or inability to use the analysis whether such claim is based on breach of warranty, contract, tort or other legal theory and regardless of the causes of such loss or damages. In no event shall Global RF Solutions entire liability to you under this Agreement exceed an amount equal to the price paid to for the analysis.

TABLE OF CONTENTS

1. INTRODUCTION

2. SITE DESCRIPTION

3. ANALYSIS

4. RESULTS

5. CONCLUSIONS AND RECOMMENDATIONS

APPENDIX A – LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

1. Introduction

A preliminary analysis of this Communications Facility has been completed to determine if it is compliant with guidelines set forth by the Federal Communications Commission (FCC) with regards to maximum human exposure limits. This analysis is done to determine the impact of a technology change-out to add PCS to the site.

Of further concern in this environment are the levels to which personnel can be exposed when servicing the light fixture above the antennas on the pole. The purpose of this analysis is to determine safe working distances from the antennas for these personnel. Two different scenarios have been modeled:

Scenario 1, where it will be assumed that personnel providing maintenance to this pole will utilize bucket trucks to access areas above ground level. It is also assumed that these workers **will not** receive adequate training to permit them to be classified as FCC Occupational personnel. Therefore, the lower tier of exposure limits will be established for the **FCC General/ Public** limits. These guidelines have been established utilizing guidelines set forth by the Federal Communications Commission (FCC) with regards to maximum human exposure limits. Calculations have been performed by using RoofView® predictive modeling software.

Scenario 2, where it will be assumed that personnel providing maintenance to this pole will utilize bucket trucks to access areas above ground level. It is also assumed that these workers **will** receive adequate training to permit them to be classified as FCC Occupational personnel. Therefore, the higher tier of exposure limits will be established for the **FCC Occupational/ Controlled limits.** These guidelines have been established utilizing guidelines set forth by the Federal Communications Commission (FCC) with regards to maximum human exposure limits. Calculations have been performed by using RoofView® predictive modeling software.

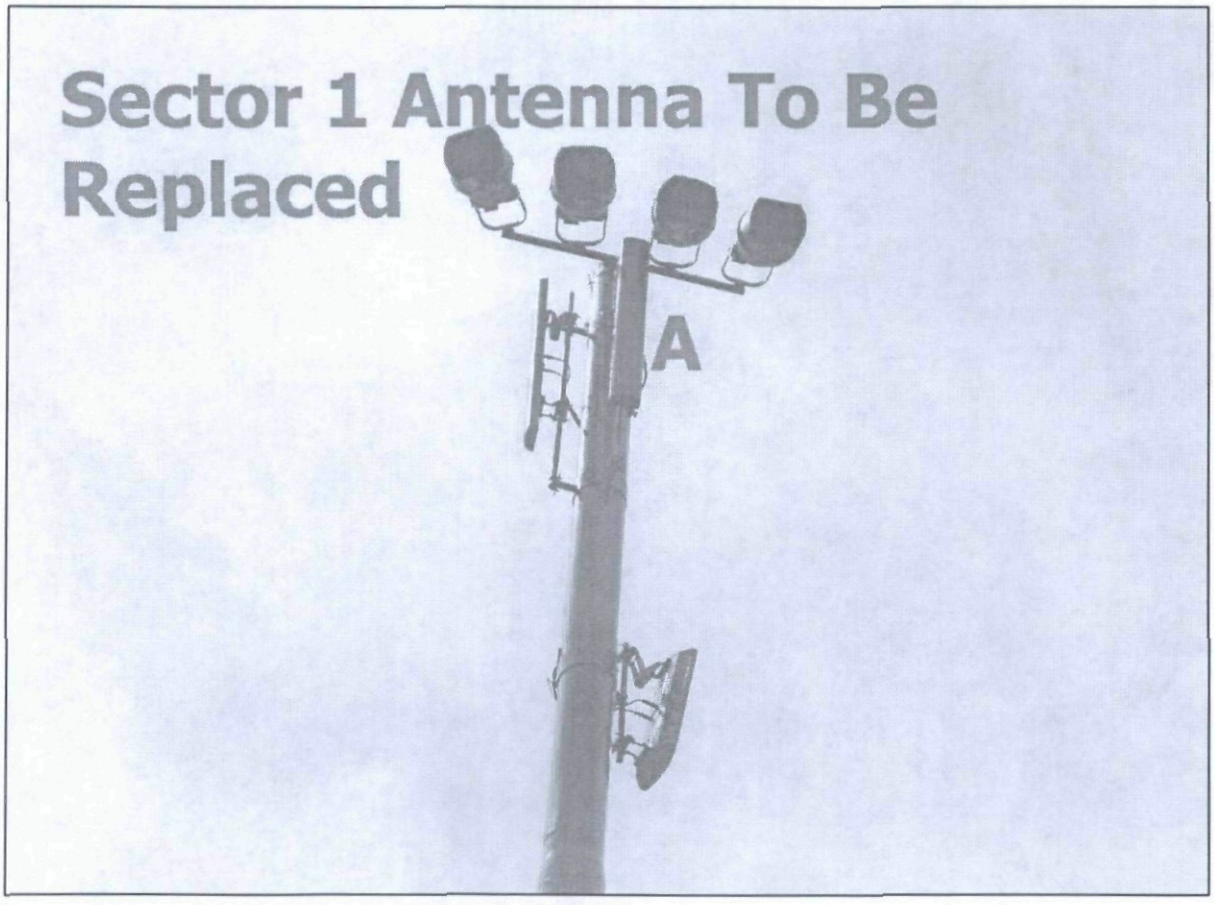
The Radio Frequency Power Density predictions have been done using 100% transmitter duty cycle. This will predict a worst-case scenario for safety reasons. The predictive software tool utilizes a cylindrical model that provides spatially averaged power density that is calculated in one square foot increments (pixels). The composite RF fields are displayed as a percentage of the exposure limit. The software tool utilized for predictive analysis is RoofView®, a product developed by Richard Tell Associates, Inc. The FCC recognizes this software tool as a valid means of determining Maximum Permissible Exposure levels (MPE).

2. SITE DESCRIPTION

Site ID: N/A			**Site Name: PHO-Carribean**			
Date of Evaluation	04/08/08		**Site Evaluator (name): Harry Young**			
Site Type	**Building**		**Tower/ Monopole**	XX	**Water Tower**	
Address: 9701 E. Bell Rd., Scottsdale, AZ 85268						
GPS NAD83	**N 33 38 2.4**		**W 111 52 17.8**	**Structure Height AGL**		**70'**
Access Restricted	**Yes**					

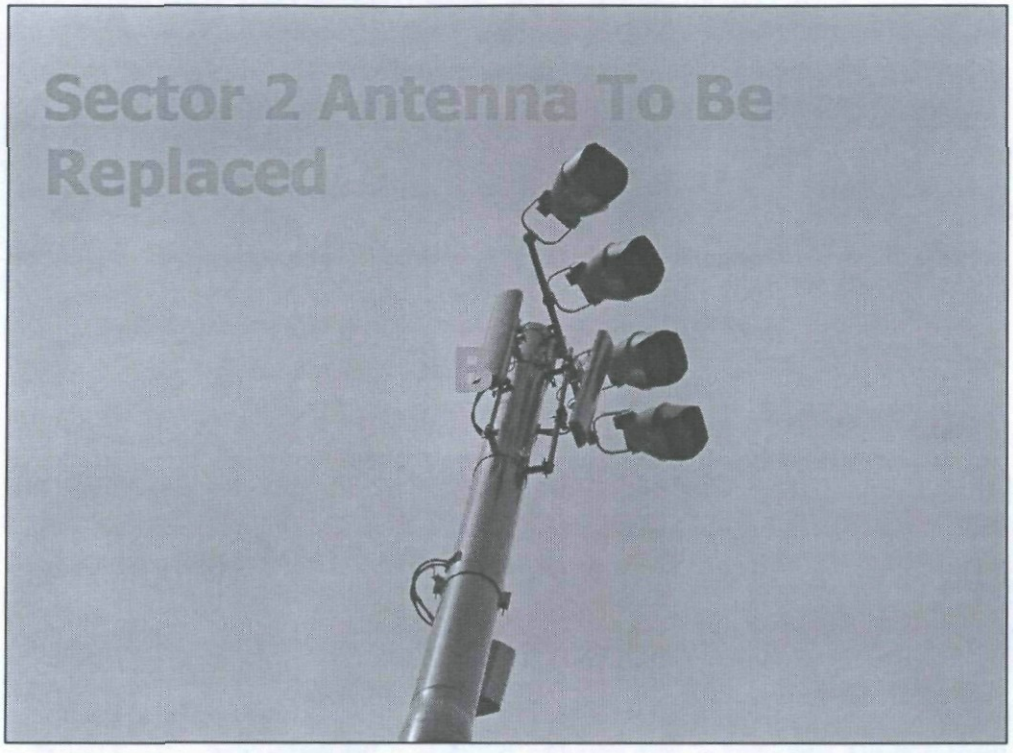
This communications site is located on a light pole at a high school athletic field. Access to the antennas is restricted by design (e.g. mounting height, location, etc.) requiring a man lift to access, but personnel may be required to perform light fixture maintenance with potential exposure to the antennas. These personnel may or may not be trained in RF safety.

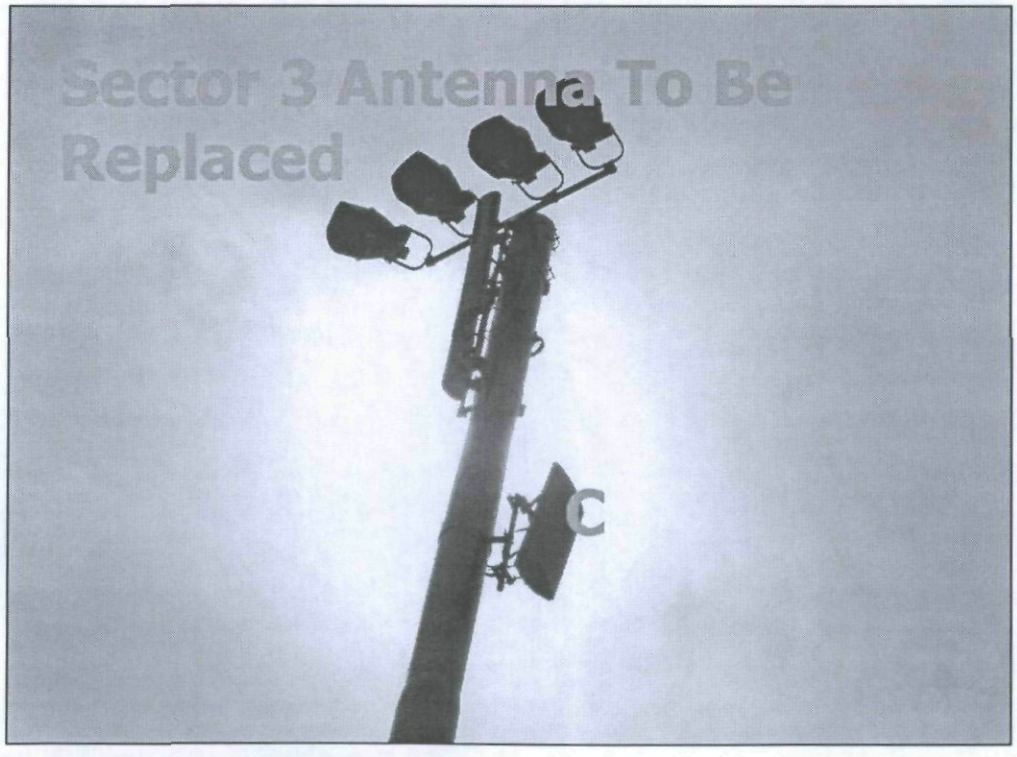
These are photographs of the proposed Verizon Wireless site PHO-Carribean:



2. SITE DESCRIPTION (continued)

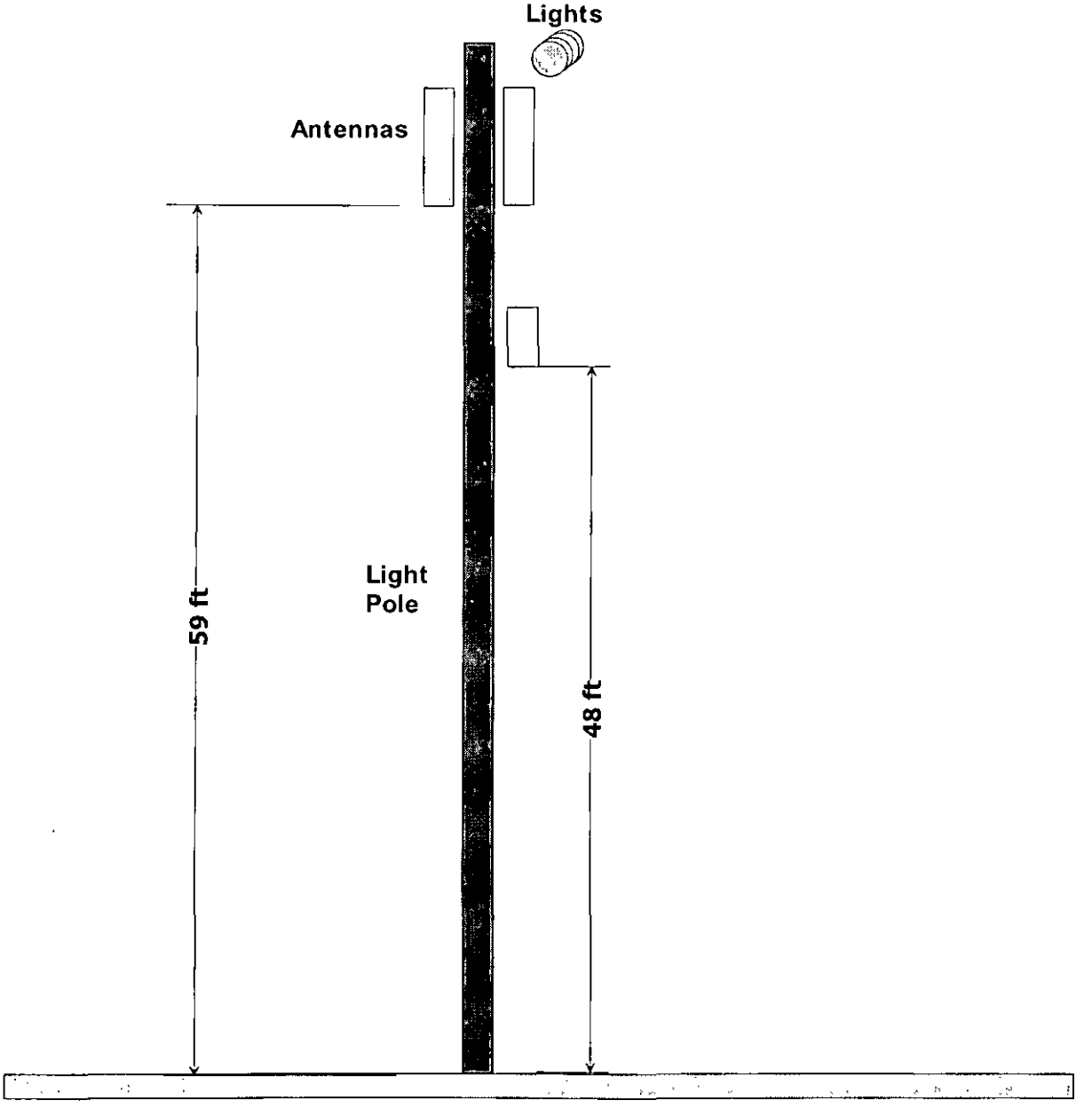
These are photographs of the proposed Verizon Wireless site PHO-Carribean:





2. SITE DESCRIPTION (continued)

This drawing depicts the layout of the proposed PHO Carribean communications facility. The site will consist of three sectors of one antenna each mounted below the light fixture on a light pole. The 8' aperture Sector 1 and 2 antennas will be mounted at a centerline of 63', with the bottom of the antennas mounted at 59' above ground level. The 4' aperture Sector 3 antenna will be mounted with a centerline of 50', with the bottom of the antenna at 48' above ground level.



2. SITE DESCRIPTION (continued)

The following technical data was used to model the proposed site:

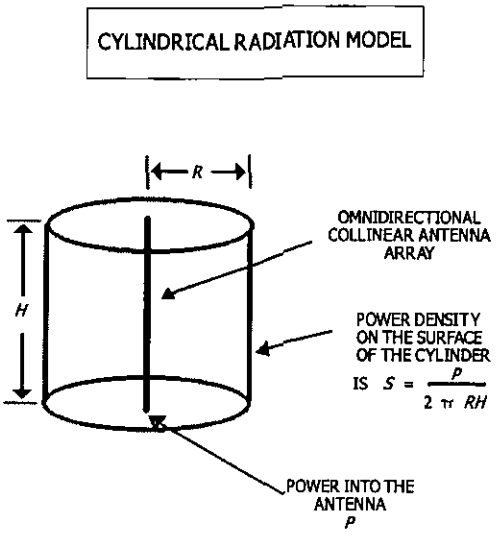
Azimuth	Aperture	Power/ Frequency	Antenna Manufacturer	Antenna Model
0 deg	8'	160w at 885 MHz 48w at 1945 MHZ	Andrew	DBXLH-6565C-VTM
90 deg	8'	160w at 885 MHz 48w at 1945 MHZ	Andrew	DBXLH-6565C-VTM
260 deg	4'	160w at 885 MHz 48w at 1945 MHZ	Antel	BXD-40404080CF

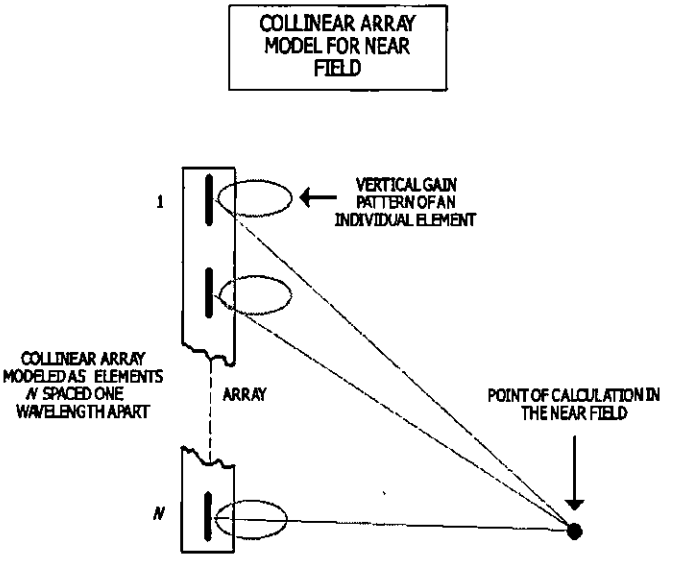
3. ANALYSIS

Site Modeling:

Electromagnetic energy (EME) exposure situations have been modeled at this site by using the following techniques. A cylindrical model in the near field of a vertical collinear antenna is run through a computer calculation engine. This model was used to compute the average power density on the surface of an imaginary cylinder, with a height equal to the antenna's aperture, and a radius equal to the distance of interest.

The collinear antenna model estimates the number of elements in the array and in the gain pattern of each element. The power density in the near field of the antenna is calculated by combining the contributions from each element in the array. The completed calculations of these models are plotted in the RESULTS section. The software tool utilized for predictive analysis is RoofView®, a product of Richard Tell Associates, Inc.





3. ANALYSIS (Continued)

RF Survey:

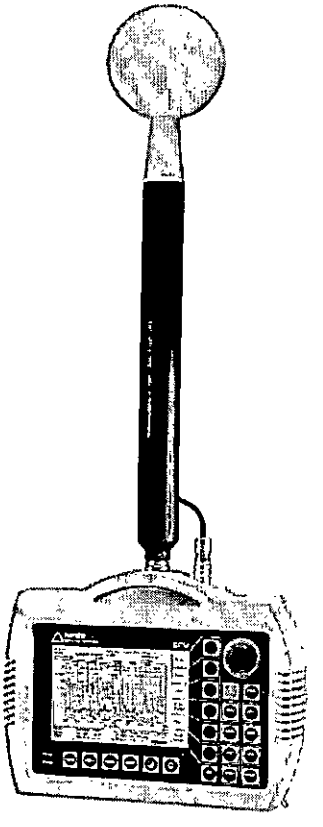
The field survey validates modeling results and defines exclusion areas at the site. Electromagnetic energy (EME) fields were assessed through direct measurement at the transmitter site, using properly calibrated field probes.

An SRM-3000 Selective Measurement Device was used for the measurement phase of this survey. This meter represents the latest generation of equipment designed to measure RF energy by Narda Safety Test Solutions.

This device uses an isotropic antenna that is calibrated to measure Radio Frequency power densities using specific selectable frequencies. Tables representing the level of RF power measured at different locations at this site are listed in the FCC Public % of Standard.

At each location measurements were made for SMR, PCS, Cellular, paging, land mobile, etc., and commercial broadcast frequencies that includes FM radio and television.

Narda **SRM-3000**

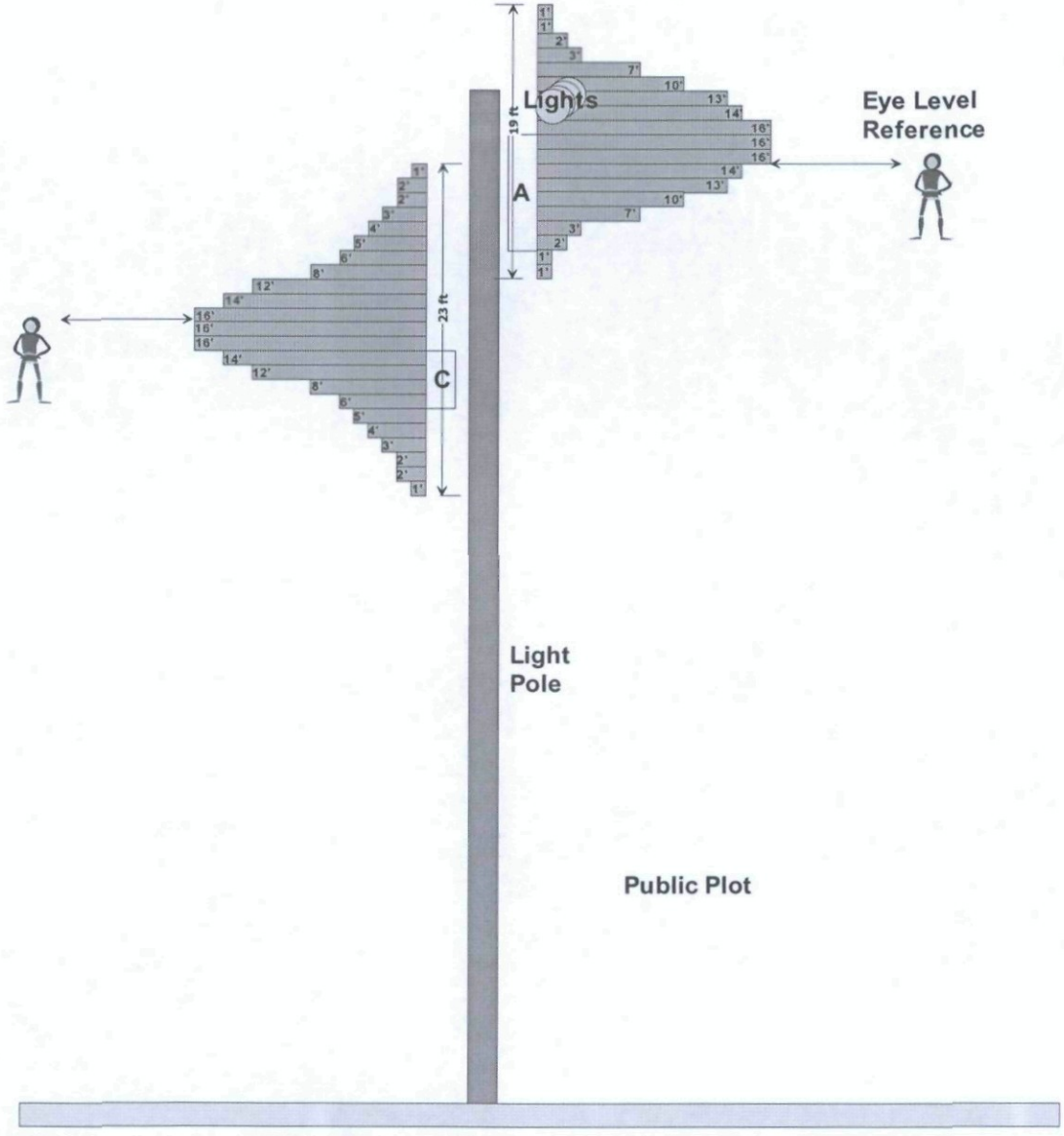


4. RESULTS

These are the predicted safe working distances for Maximum Permissible Exposure (MPE) for this proposed Verizon Wireless light pole site. This site has been analyzed using the **FCC PUBLI C STANDARD** (Scenario 1). The predicted worst case MPE levels were calculated using the antennas and technical data listed on page 8

These calculations **ONLY APPLY TO Verizon Wireless** using the data supplied on page 8 for each sector. **Any other combination of antennas and data will change these calculations!**

NOTE: The illustrations show the reference point for the worker's eye level relative to the antennas for each distance.

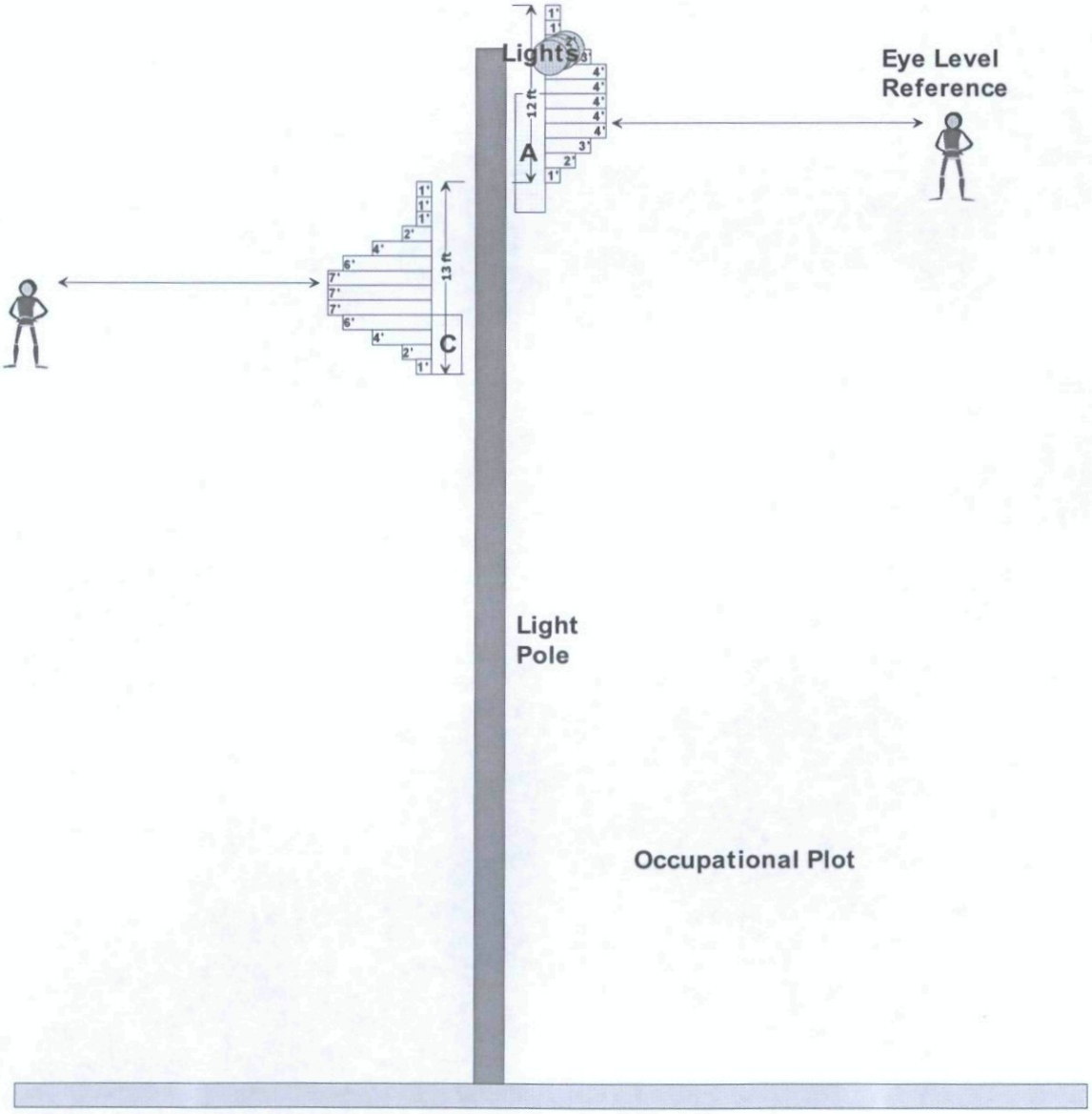


4. RESULTS (continued)

These are the predicted safe working distances for Maximum Permissible Exposure (MPE) for this proposed Verizon Wireless light pole site. This site has been analyzed using the **FCC OCCUPATIONAL STANDARD** (Scenario 2). The predicted worst case MPE levels were calculated using the antennas and technical data listed on page 8.

These calculations **ONLY APPLY TO Verizon Wireless** using the data supplied on page 8 for each sector. **Any other combination of antennas and data will change these calculations!**

NOTE: The illustrations show the reference point for the worker's eye level relative to the antennas for each distance.



4. RESULTS (continued)

As a baseline, these are the Narda SRM-3000 meter survey results from the ground level for the existing antennas. The spatial average RF Power density levels for Verizon Wireless antennas were measured and are listed in the table below according to service type, frequency range and percentage of FCC Public standard each frequency range contributes to the measurement location. Verizon Wireless operates in the **Cellular B, EAMPS B, and PCS C bands** in this market.

Location 1

narda
Safety Test Solutions

Standard: FCC GP

Service	Value	Lower Frequency	Upper Frequency
TV 2-6	0.0079546 %	54.000 MHz	88.000 MHz
FM Radio	0.0026879 %	88.000 MHz	108.000 MHz
TV 7-13	0.0023615 %	174.000 MHz	220.000 MHz
Land Mobile	0.0002548 %	450.000 MHz	470.000 MHz
TV 14-69	0.0051452 %	470.000 MHz	806.000 MHz
Land Mobile	0.0000869 %	806.000 MHz	824.000 MHz
SMR (Nextel)	0.0000963 %	850.000 MHz	868.900 MHz
Cellular A	0.0001537 %	869.000 MHz	879.990 MHz
Cellular B	0.0232480 %	880.000 MHz	890.000 MHz
EAMPS A	0.0000056 %	890.010 MHz	891.480 MHz
EAMPS B	0.0000120 %	891.510 MHz	893.970 MHz
Paging	0.0000109 %	929.000 MHz	932.000 MHz
PCS A	0.0036655 %	1930.000 MHz	1944.990 MHz
PCS D	0.0000212 %	1945.000 MHz	1949.990 MHz
PCS B	0.0000783 %	1950.000 MHz	1964.990 MHz
PCS E	0.0063403 %	1965.000 MHz	1969.990 MHz
PCS F	0.0020907 %	1970.000 MHz	1974.990 MHz
PCS C	0.0000995 %	1975.000 MHz	1990.000 MHz
Others	0.0145050 %		
Total	0.0688180 %	54.000 MHz	1990.000 MHz
Isotropic Result			

5. CONCLUSIONS AND RECOMMENDATIONS

The Narda SRM-3000 survey measurements have shown that Verizon Wireless transmitter equipment located at this current site **cannot exceed** the maximum permissible exposure levels for the FCC Public standards at ground level. The predicted software analysis also shows that the reconfiguration at this site will not affect ground level exposure. This site **is and will be compliant** at ground level. Although not considered ordinarily accessible, the report also shows the effect on personnel who are required to perform work on the light fixture.

The results for **Scenario 1** show that workers that are exposed as a consequence of their employment that may not be fully aware of the potential for exposure, could be exposed to MPE levels > 100% of the **FCC PUBLIC STANDARD**. This can occur at a distance of up to 19 feet vertically and 16 feet horizontally from the antennas A and B, while at a distance of 23' vertically and 16' horizontally from antennas C, all in a worst case scenario (see page 11 for details). These results assume that the equipment uses the maximum transmitter capacity with 100% duty cycle (Worst case scenario).

If personnel are performing maintenance near this proposed transmitter site utilizing bucket trucks, or other vertical lift equipment to access areas adjacent to the described antennas, they must remain the prescribed distances away from the antennas to ensure that the FCC Public MPE limits are not exceeded. At the height of the light fixture where maintenance is most likely to occur, workers are not of sufficient distance away from the antennas to be within FCC Public Standards for safety, and will require power reduction for this sector to 20 watts maximum to allow for a 2' clearance while working on the lights.

5. CONCLUSIONS AND RECOMMENDATIONS (cont.)

The results for **Scenario 2** show that workers whose RF exposure is induced as a consequence of their employment **AND** who have been made fully aware of the potential for exposure and can exercise control over their exposure such as through the use of administrative or engineering controls or safe work practices (e.g., use of personal protective equipment or time averaging of exposures), could be exposed to MPE levels > 100% of the **FCC OCCUPATIONAL STANDARD.** This can occur at a distance of up to 12 feet vertically and 4' foot horizontally from antennas A and B, and 13' vertically and 7' horizontally for antenna C, all in a worst case scenario (see page 12 for details). The best way to achieve this awareness is to receive RF Safety training.

At the height of the light fixture where maintenance is most likely to occur, workers are not of sufficient distance away from the antennas to be within FCC Occupational Standards for safety, and will need to exercise the controls mentioned above. If elected, a power reduction for this sector to 100 watts maximum would allow for a 2' clearance while working on the lights.

A Caution and 10-site guidelines sign should be posted on the light pole below the level of the antennas at approximately 40' AGL.

APPENDIX A lists the exposure levels permitted by Title 47 of the Code of Federal Regulations for the FCC Public and Occupational limits.

6. Engineering Certification

I, Michael Burgett, am registered as a Professional Engineer in the State of Arizona. I am a subcontractor to Global RF Solutions in Chandler, Arizona. It is under this agreement between Global RF Solutions and EDI Electrical Designs, Inc that I provide RF Compliance services to Verizon Wireless, subject to the Federal Communication Commission Maximum Permissible Exposure (MPE) standards as stated in OET65.

I am knowledgeable of the Rules and Regulations of the Federal Communication Commission (FCC) and of the Occupational Safety and Health Administration (OSHA), both in general and specifically as they apply to the FCC's Guidelines for Human Exposure to Radio-frequency Radiation.

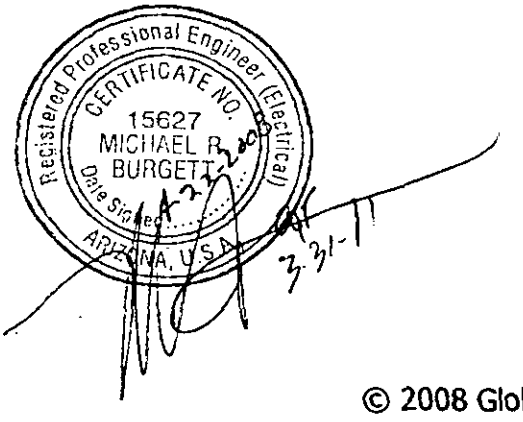
The survey modeling of the environment of the site identified as:

Site ID: N/A		**Site Name: PHO-Carribean**
Date of Evaluation	**04/08/2008**	**Site Evaluator (name): Harry Young**

have been performed in order to determine compliance with the controlled environment and uncontrolled environment Maximum Permissible Exposure levels.

The modeling evaluation was conducted using software (RoofView®) provided by Richard Tell Associates, Inc.

I have reviewed this Site Safety Evaluation and believe it to be true and accurate to the best of my knowledge.



Michael R. Burgett
Registered Professional Engineer
State of Arizona Registration Number 15627
Tuesday, April 22, 2008

APPENDIX A- LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

(REFERENCE= TABLE 1. Title 47 CFR)

(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
300-1500	--	--	f/300	6
1500-100,000	--	--	5	6

(B) Limits for General Population/ Uncontrolled 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)
0.3-1.34	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
300-1500	--	--	f/1500	30
1500-100,000	--	--	1.0	30

f = frequency in MHz* Plane-wave equivalent power density

NOTE 1: ***Occupational/controlled*** limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

NOTE 2: ***General population/uncontrolled*** exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.