STATE OF CONNECTICUT

CONNECTICUT SITING COUNCIL

Ten Franklin Square
New Britain, Connecticut 06051
Phone: (860) 827-2935
Fax: (860) 827-2950

File
Park
Sharkey
Terry

June 26, 2000

J. Brendan Sharkey, Esq.
VoiceStream Wireless, Inc.
100 Filley Street
Cromwell, CT 06002

RE: TS-VOICESTREAM-033-000609 - VoiceStream Wireless request for an order to approve tower sharing at an existing telecommunications facility located at 179 Shunpike Road in Cromwell, Connecticut.

Dear Attorney Sharkey:

At a public meeting held June 20, 2000, the Connecticut Siting Council (Council) ruled that the shared use of this existing tower site is technically, legally, environmentally, and economically feasible and meets public safety concerns, and therefore, in compliance with General Statutes § 16-50aa, the Council has ordered the shared use of this facility to avoid the unnecessary proliferation of tower structures. This facility has also been carefully modeled to ensure that radio frequency emissions are conservatively below State and federal standards applicable to the frequencies now used on this tower.

This decision is under the exclusive jurisdiction of the Council. Any additional change to this facility may require an explicit request to this agency pursuant to General Statutes § 16-50aa or notice pursuant to Regulations of Connecticut State Agencies Section 16-50j-73, as applicable. Such request or notice shall include all relevant information regarding the proposed change with cumulative worst-case modeling of radio frequency exposure at the closest point uncontrolled access to the tower base, consistent with Federal Communications Commission, Office of Engineering and Technology, Bulletin 65. Any deviation from this format may result in the Council implementing enforcement proceedings pursuant to General Statutes § 16-50u including, without limitation, imposition of expenses resulting from such failure and of civil penalties in an amount not less than one thousand dollars per day for each day of construction or operation in material violation.

This decision applies only to this request for tower sharing and is not applicable to any other request or construction. The proposed shared use is to be implemented as specified in your letter dated June 9, 2000.

Thank you for your attention and cooperation.

Very truly yours,

Mortimer A. Gelston
Chairman

MAG/PMA/grg

c: Honorable Stanley A. Terry, Jr., First Selectman, Town of Cromwell

TS-VOICESTREAM-033-000609

VoiceStream WIRELESS

100 Filley Street, Cromwell, CT 06002
(860) 692-7154 phone
(860) 692-7159 fax

RECEIVED
JUN -9 2000
CONNECTICUT
SITING COUNCIL

9 June, 2000

Mortimer A. Gelston, Chairman
Connecticut Siting Council
10 Franklin Square
New Britain, CT 06051

Re: Request by VoiceStream Wireless for an Order to Approve the Shared Use of a Tower Facility
179 Shunpike Road, Cromwell, Connecticut

Dear Chairman Gelston and Members of the Council:

Pursuant to Connecticut General Statutes §16-50aa, VoiceStream Wireless ("VoiceStream") hereby requests an order from the Connecticut Siting Council ("Council") to approve the proposed shared use by the Applicant of an existing tower located at 179 Shunpike Road in Cromwell, Connecticut. The tower is owned and operated by the Cromwell Fire District. VoiceStream proposes to install antennas on the existing tower located within a leased compound area, and to locate the equipment associated with this facility near the base of the tower within the existing compound (see "Exhibit A"). The Applicant requests that the Council find that the proposed shared use of the tower satisfies the criteria stated in §16-50aa and issue an order approving the proposed use.

Background

In February, 2000, VoiceStream acquired from Omnipoint Communications, Inc. the "A block" "Wideband PCS" license for the 2-GH_Z PCS frequencies for the Greater New York City area, including the entire State of Connecticut. VoiceStream provides PCS wireless telephone service in the State of Connecticut, which includes the area to be served by VoiceStream's proposed installation.

The tower at 179 Shunpike Road in Cromwell is a 170-foot lattice tower located within an equipment compound off Shunpike Road. The coordinates for the site are **41-37-24 N** and **72-40-44 W**. The tower currently holds the Town of Cromwell's antennas at various heights as well as those of AT&T Wireless ("AT&T") with centerlines at 160 feet above ground level ("AGL").

VoiceStream proposes to install six (6) EMS RR 90-1702 DP antennas on the tower with centerlines at 125 feet AGL. The radio transmission equipment associated with these antennas, a Nortel S8000 cabinet, would be located near the base of the tower on an existing concrete pad. Exhibit B contains specifications for the proposed antennas and equipment cabinet.

VoiceStream and the Cromwell Fire District have agreed to the proposed shared use of this tower pursuant to mutually acceptable terms and conditions, and the Fire District has authorized VoiceStream to act on its behalf to apply for all necessary local, state and federal permits, approvals, and authorizations that may be required for the proposed shared use of this facility.

C.G.S. §16-50aa (c) (1) provides that, upon written request for approval of a proposed shared use, "if the council finds that the proposed shared use of the facility is technically, legally, environmentally and economically feasible and meets public safety concerns, the council shall issue an order approving such shared use." The shared use of the tower satisfies those criteria as follows:

A. **Technical Feasibility** The existing tower is structurally sound and capable of supporting the proposed VoiceStream antennas. A structural analysis of the tower with the proposed VoiceStream installation has been performed and is attached as Exhibit C. The proposed shared use of this tower therefore is technically feasible.

B. **Legal Feasibility** Under C.G.S. § 16-50aa, the Council has been authorized to issue orders approving the proposed shared use of an existing tower facility such as the facility on Shunpike Road in Cromwell. This authority complements the Council's prior-existing authority under C.G.S. § 16-50p to issue orders approving the construction of new towers that are subject to the Council's jurisdiction. C.G.S. § 16-50x (a) vests exclusive jurisdiction over these facilities in the Council, which shall "give such consideration to other state laws and municipal regulations as it shall deem appropriate" in ruling on requests for the shared use of existing towers facilities. Under this statutory authority vested in the Council, an order by the Council approving the shared use would permit the applicant to obtain a building permit for the proposed installations.

C. **Environmental Feasibility** The proposed shared use would have a minimal environmental effect, for the following reasons:

1. The proposed installations would have an insignificant incremental visual impact, and would not cause any significant change or alteration in the physical or environmental characteristics of the existing site. In particular, the proposed installations would not increase the height of the existing tower, and would not extend the boundaries of the existing Sprint compound area.

2. The proposed installations would not increase the noise levels at the existing facility by six decibels or more.

3. Operation of antennas at this site would not exceed the total radio frequency electromagnetic radiation power density level adopted by the American National Standards Institute ("ANSI"). The "worst-case" exposure calculated for operation of this facility (i.e., calculated at the base of the tower, which represents the closest publicly accessible point within the broadcast field of the antennas), with the Town's and AT&T's antennas, would be 3.927% of the ANSI standard. These calculations are attached as Exhibit D.

4. The proposed installations, would not require any water or sanitary facilities, or generate air emissions or discharges to water or sanitary facilities, or generate air emissions or discharges to water bodies. After construction is complete (approximately two weeks), the proposed installations would not generate any traffic other than periodic maintenance visits.

The proposed use of this facility would therefore have a minimal environmental effect, and is environmentally feasible.

E. **Economic Feasibility** As previously mentioned, Sprint and VoiceStream have entered into a mutual agreement to share the use of the existing tower on terms agreeable to the parties. The proposed tower sharing is therefore economically feasible.

F. **Public Safety Concerns** As stated above, the existing tower is structurally capable of supporting the proposed VoiceStream antennas. The tower stands on a compound accessible from an existing access drive off Shunpike Road. VoiceStream is not aware of any other public safety concerns relative to the proposed sharing of the existing tower. In fact, the tower was initially approved by the relevant Cromwell land use agencies with an eye toward public health and safety concerns, and the provision of new or improved phone service through shared use of the existing tower will enhance the safety and welfare of area residents.

Conclusion

For the reasons discussed above, the proposed shared use of the existing tower facility at 179 Shunpike Road in Cromwell, Connecticut satisfies the criteria stated in C.G.S. §16-50aa, and advances the General Assembly's and the Siting Council's goal of preventing the proliferation of towers in Connecticut. The Applicant therefore requests that the Siting Council issue an order approving the proposed shared use.

Thank you for your consideration of this matter.

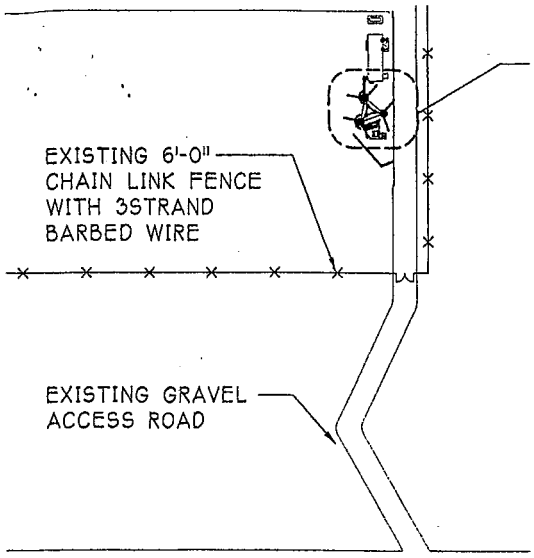
Sincerely,

J. Brendan Sharkey, Esq.
for VoiceStream Wireless, Inc.

enclosures
cc: Anthony Varricchio, Sr., First Selectman, Town of Cromwell

Exhibit A

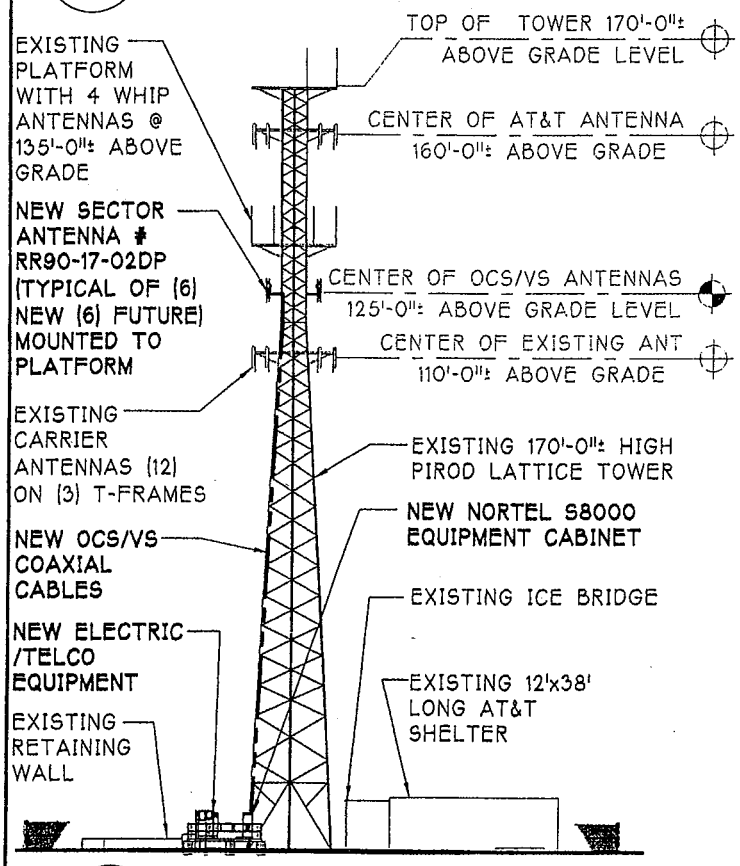
Design Drawings
179 Shunpike Road
Cromwell, CT



1 / LE-1 KEY PLAN

SCALE: NOT TO SCALE

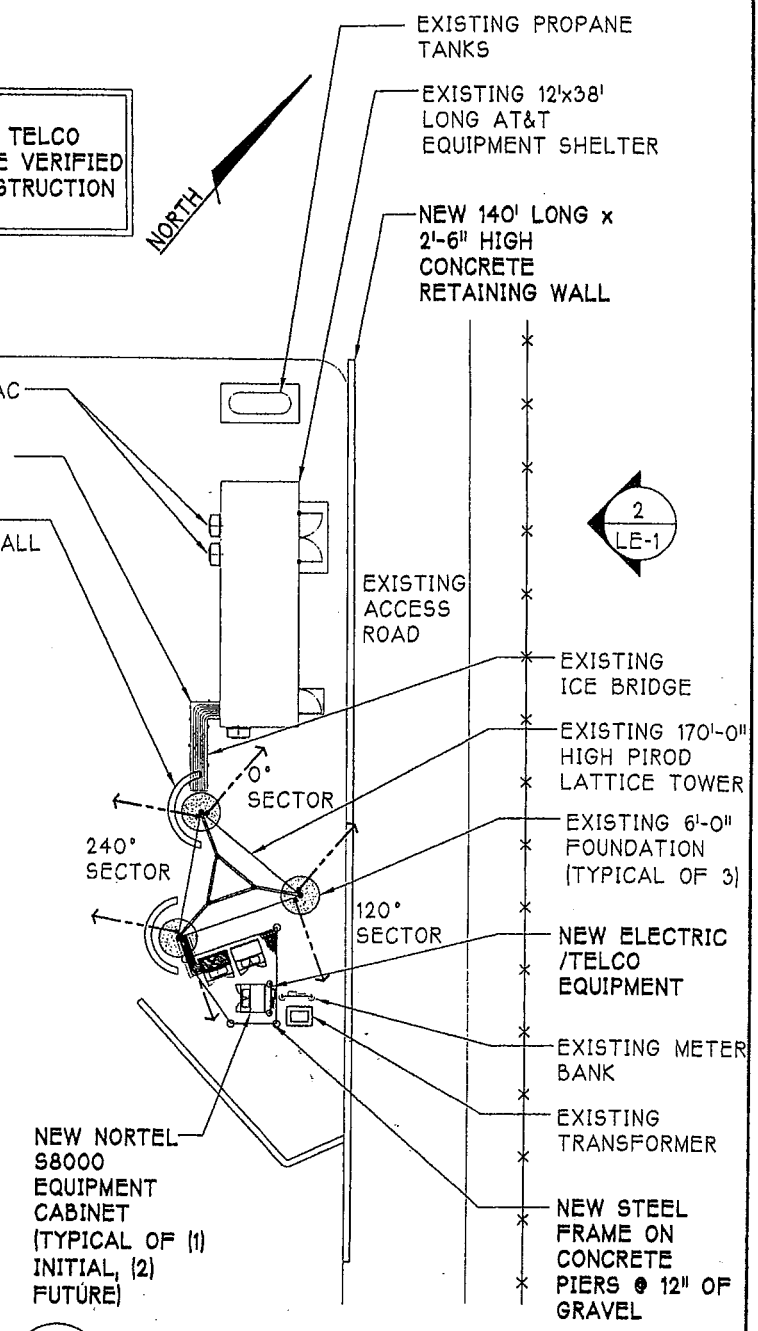
NOTE:
ELECTRIC AND TELCO SERVICE TO BE VERIFIED PRIOR TO CONSTRUCTION DOCUMENTS



2 / LE-1 ELEVATION

SCALE: NOT TO SCALE

NOTE: EXHIBITS SUBMITTED ARE A CONCEPTUAL REPRESENTATION OF THE LEASE AGREEMENT ONLY. ACTUAL CONSTRUCTION DOCUMENTATION MAY VARY TO COMPLY WITH ALL APPLICABLE CODES.



3 / LE-1 PARTIAL SITE LAYOUT

SCALE: 1" = 30-0"

NOTE:
ALL LENGTHS ARE ESTIMATED AND ARE NOT FOR CONSTRUCTION. CONTRACTOR TO VERIFY ALL FIELD CONDITIONS AND LENGTHS PRIOR TO ORDERING MATERIALS.

CABLE SCHEDULE

ORIENTATION	RX/TX	LENGTH	DIAM.
1 0°	RX	150FT.±	1 5/8"
	TX	150FT.±	1 5/8"
2 120°	RX	150FT.±	1 5/8"
	TX	150FT.±	1 5/8"
3 240°	RX	150FT.±	1 5/8"
	TX	150FT.±	1 5/8"

ARCNET ARCHITECTS, INC.
670 North Beers Street, Building 2, Holmdel, NJ 07733
Tel: 732.739.3200 Fax: 732.739.0440

Drawing Title: SITE LAYOUT

Client: OCS — Omnipoint Communications Inc. is a subsidiary of VoiceStream Wireless Corporation

Project: AT&T TOWER
Address: 179 SHUNPIKE RD CROMWELL, CT
Search Area: ROCKY HILL
Site ID No.: CT-11-059C

VoiceStream WIRELESS

P.C.	P.C. Chkd.	ARCNET Project No.	Drawn	Date:
JDi		10658	DDe	5/19/2K

Approved By: CLIENT: _____ DATE: _____

Revision No.	Date:

Drawing No. LE-1

C:\NfmWork\10462_PRINT\10658_~1.DWG, 05/19/2000 04:57:46 PM, DDe La Rosa

Exhibit B

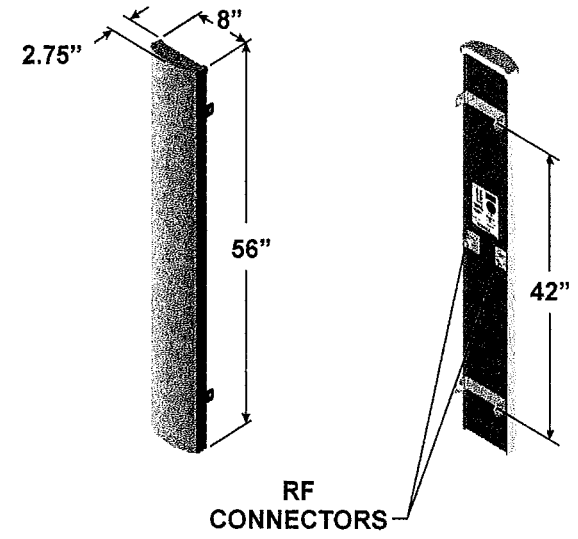
Equipment Specifications
179 Shunpike Road
Cromwell, CT

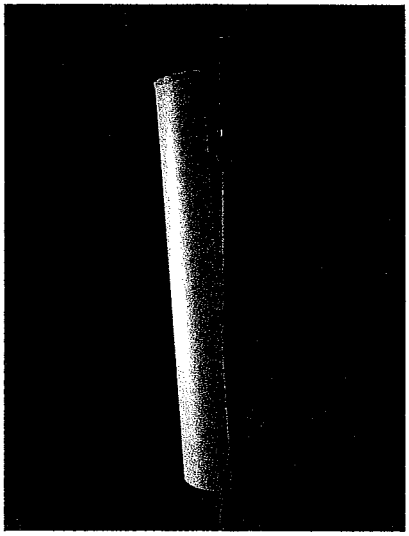
EMS WIRELESS

OptiRange™

RR90-17-XXXP

1850 MHz - 1990 MHz (P)





90° beamwidth

16.5 dBi gain

±45° DualPol™

56 inch

SPECIFICATIONS

Electrical

Azimuth Beamwidth	90°
Elevation Beamwidth	6°
Gain	16.5 dBi (14.4 dBd)
Polarization	Slant, ±45°
Port-to-Port Isolation	≥ 30 dB
Front-to-Back Ratio	≥ 25 dB (≥ 30 dB Typ.)
Electrical Downtilt Options	0°, 2°, 4°, 6°
VSWR	1.35:1 Max
Connectors	2;Type N or 7-16 DIN (female)
Power Handling	250 Watts CW
Passive Intermodulation	<-147 dBc (2 tone @ +43 dBm {20W} ea.)
Lightning Protection	Chassis Ground

Mechanical

Dimensions (L x W x D)	56in x 8in x 2.75in (142 cm x 20.3 cm x 7.0 cm)
Rated Wind Velocity	150 mph (241 km/hr)
Equivalent Flat Plate Area	3.1ft² (.29 m²)
Front Wind Load @ 100 mph (161 kph)	90 lbs (400 N)
Side Wind Load @ 100 mph (161 kph)	31 lbs (139 N)
Weight	18 lbs (8.2 kg)

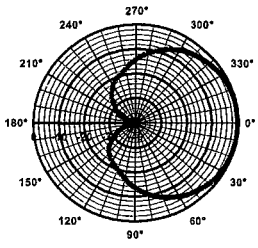
Note: Patent Pending and US Patent number 5, 757, 246.

Values and patterns are representative and variations may occur. Specifications may change without notice due to continuous product enhancements. Digitized pattern data is available from the factory or via the web site www.emswireless.com and reflect all updates.

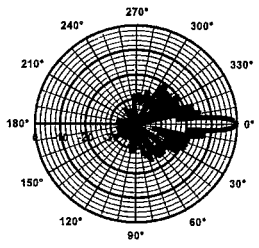
MOUNTING OPTIONS

Model Number	Description	Comments
MTG-P00-10	Standard Mount (Supplied with antenna)	Mounts to Wall or 1.5 inch to 5.0 inch O.D. Pole (3.8 cm to 12.7 cm)
MTG-S02-10	Swivel Mount	Mounting kit providing azimuth adjustment.
MTG-DXX-20*	Mechanical Downtilt Kits	0° - 10° or 0° - 15° Mechanical Downtilt
MTG-CXX-10*	Cluster Mount Kits	3 antennas 120° apart or 2 antennas 180° apart
MTG-C02-10	U-Bolt Cluster Mount Kit	3 antennas 120° apart , 4.5" O.D. pole.
MTG-TXX-10*	Steel Band Mount	Pole diameters 7.5" - 45"

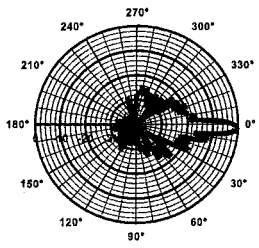
* Model number shown represents a series of products. See mounting options section for specific model number.



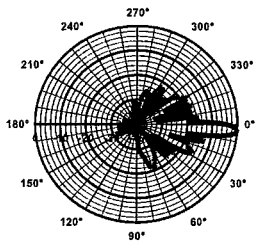
Azimuth



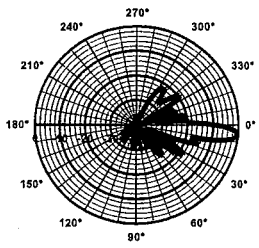
Elevation
0° Downtilt



Elevation
2° Downtilt



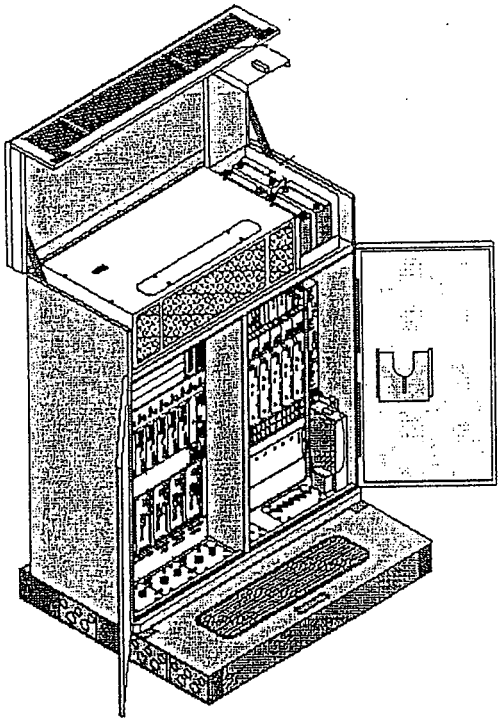
Elevation
4° Downtilt

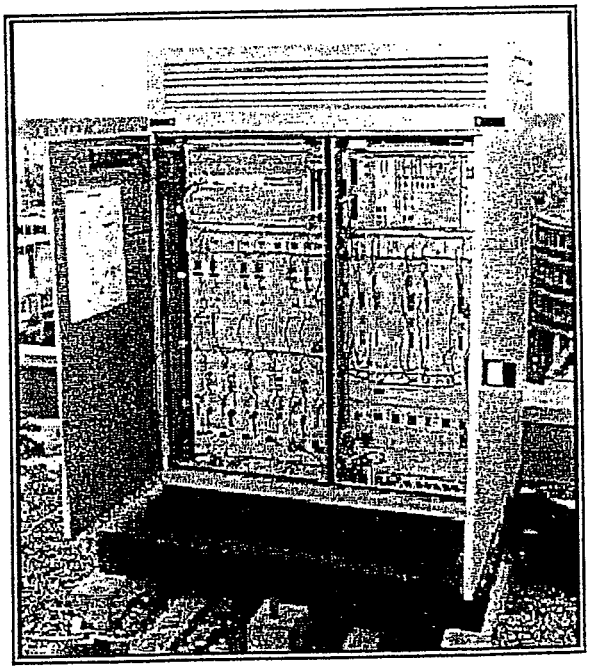


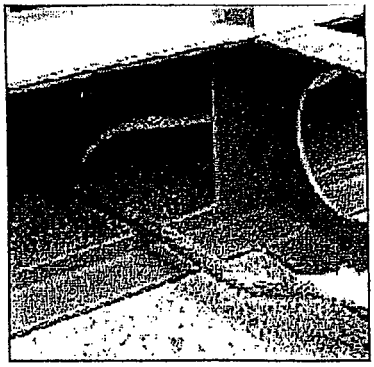
Elevation
6° Downtilt

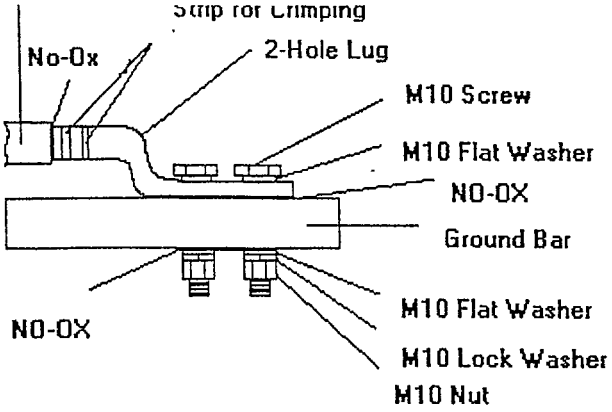
NORTEL NETWORKS™

S8000 BTS
Site Specifications









Apply a light coating of No Oxidation (NO-OX) to the ground bar area.

Dimensions, Weights & Clearances

BTS

Weight: 915 pounds
Dimensions: 53.2"W x 26"D x 63"H

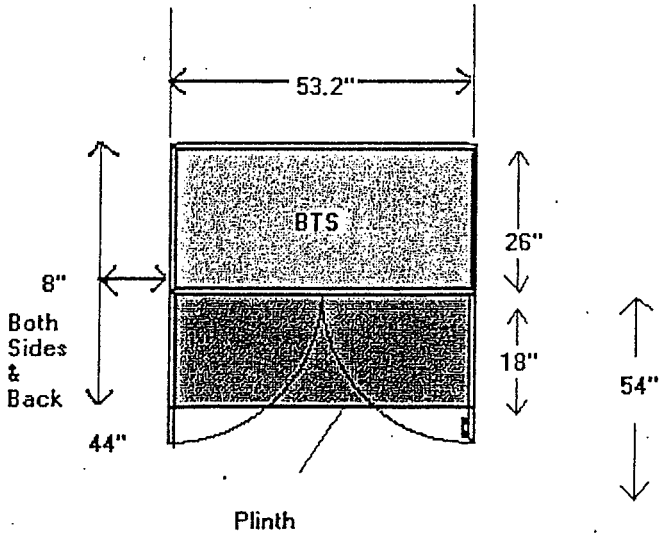
Clearances while transporting in building:
- Door Access:
  - Height: 6.6 feet
  - Width 3 feet
- Corridor Access:
  - Height: 6.6 feet
  - Width: 3.6 feet (straight), 6.6 feet (right angle)

Clearances when installed:
- Above: 28 inches for opening of hood
- Rear: 8 inches for installation of outer skin
- Sides: 8 inches for adjustment of door hinges
- Front: 54 inches to open door and technician access

Plinth

Weight:
87 pounds

Dimensions:
53.2"W x 44"D x 10.2"H



Floor Characteristics

Minimum Floor Resistance:
123 pounds/foot^2

Flatness:
¼ inch over 78 inches

Electrical Specifications

Split Single-Phase

3 wires plus ground

L1: Black 6 gauge

L2: Red 6 gauge

Neutral: White 6 gauge

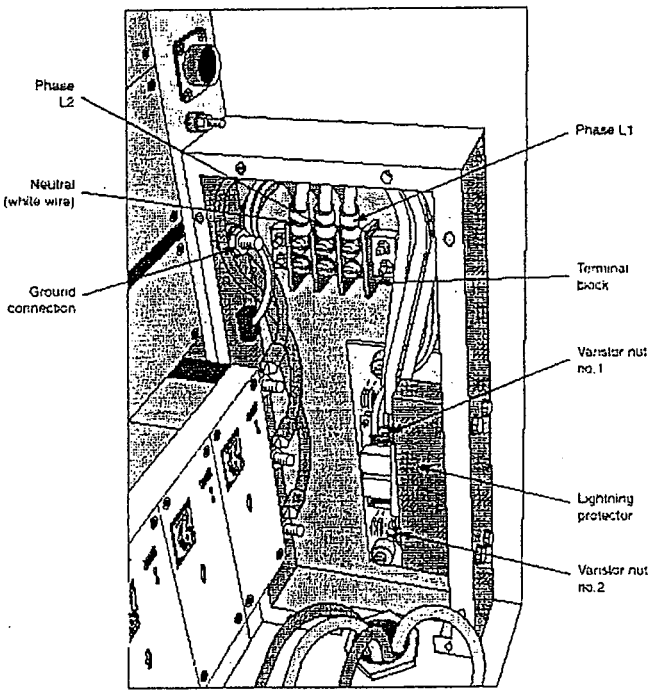
Ground: Yellow/Green 6 gauge

Maximum distance between AC box and BTS: 105 feet

187 ~ 254 VAC between L1 and L2

99 ~ 127 VAC between Neutral and L1 or L2

45 ~ 65 Hertz



AC connection to BTS located at the front, lower, right-hand side of BTS

Circuit Breaker in AC Box

Up to 4 transmitters

30 A, bipolar, C curve

5 or more transmitters

40A, bipolar, C curve

BTS to Ground connection

Minimum 2 AWG, run in most direct route as possible towards true earth, minimizing bends. No bend shall be less than 90 degrees.

VoiceStream WIRELESS

Exhibit C

Structural Analysis
179 Shunpike Road
Cromwell, CT

PAUL J. FORD AND COMPANY
STRUCTURAL ENGINEERS
250 East Broad Street • Suite 500 • Columbus, Ohio 43215

May 4, 2000

ARCNET
100 Filley Street
Bloomfield, CT 06002

Attn: Mr. Joe Dibernardo

Re: Existing 170-ft. self-supporting tower
Cromwell, CT (Rocky Hill Site - #059C)
(PJF Job No. 34300-4)

Dear Joe,

We have completed our analysis of the existing Cromwell tower. The existing tower was originally manufactured by PiRod Inc. in 1999. Our analysis was performed to determine if the existing tower has the capacity to safely support the revised loading as shown on page one of the enclosed sketches. Please note that we assumed all (44) coax to be distributed to all three tower legs, with no more than (15) runs on any one tower leg.

Our analysis was performed in accordance with the Electronic Industries Association Standard ANSI/EIA-222 revision F 1996. The standard recommends a minimum design wind velocity of 85-mph for Middlesex County. If ice accumulation is to be considered, then the EIA standard allows a reduced design wind velocity of 74 mph with simultaneous ½" radial ice. The existing tower has the capacity to safely withstand 100 mph winds with no ice and 83 mph winds with ½" ice. As you can see, the existing tower has the capacity to safely support the revised loading, and no modifications are required at this time.

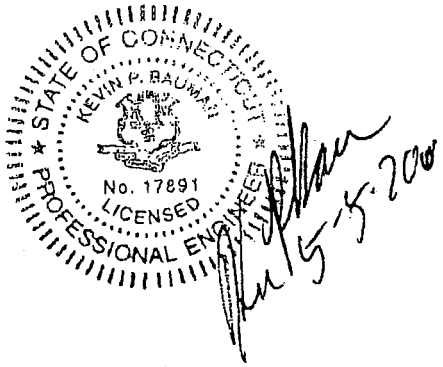
We could not calculate the capacity of the existing foundation system since a site specific soils report was not available. The revised base reactions we calculated, however, are less than the original design reactions as shown on the 1999 PiRod drawings.

If you have any questions or require any additional information, please call.

Sincerely,

PAUL J. FORD AND COMPANY

Kirk R. Hall, EIT
Project Engineer
Email: khall@pjfweb.com



VoiceStream WIRELESS

Exhibit D

Power Density Calculations
179 Shunpike Road
Cromwell, CT

100 Filley St., Bloomfield, CT 06002
Phone: (860) 692 - 7129
Fax: (860) 692 - 7159

Technical Memo

To: Brendan Sharkey
From: Haider Syed (Radio Engineering Consultant)
cc: Mike Fulton
Subject: Power Density Report for CT11059
Date: 6/9/2000

1. Introduction:
This report is the result of an Electromagnetic Field Intensities (EMF - Power Densities) study for the proposed VoiceStream Wireless PCS antenna installation on Tower at Shunpike Rd, Cromwell, CT. This study incorporates the most conservative considerations for determining the practical combined worst case power density levels that would be theoretically encountered from several locations surrounding the transmitting location.

2. Discussion:
The following assumptions were used in the calculations:

1) The emissions from the Voicestream transmitters are in the 1930-1950 MHz frequency band.
2) The antenna cluster consists of three sectors, with two antennas per sector. The model number for each antenna is EMS RR90 17 02 DP
3) The antenna height is 125 feet centerline.
4) The maximum transmit power from each sector is 1763.97 Watts Effective Isotropic Radiated Power (EiRP) assuming four channel capacity.
5) All the antennas are simultaneously transmitting and receiving, 24 hours a day.
6) Power levels emitting from the antennas are increased by a factor of 2.56 to account for possible in-phase reflections from the surrounding environment. This is rarely the case, and if so, is never continuous.
7) The average ground level of the studied area does not significantly change with respect to the transmitting location.

Equations given in "FCC OET Bulletin 65, Edition 97-01" were then used with the above information to perform the calculations.

3. Conclusion:
Based on the above worse case assumptions, the power density calculations from the proposed VoiceStream Wireless, PCS antenna installation on Tower at Shunpike Rd, Cromwell, CT is 0.02477 mw/cm^2. This value represents only 2.477% of the Maximum Permissible Emission (MPE) standard of 1000 microwatts per square centimeter (μw/cm^2) set forth in the FCC/ANSI/IEEE C95.1-1991. The combined % MPE with all the carriers is 3.927 %. Details are shown in the attachment. Furthermore, the proposed antenna location for VoiceStream Wireless will not interfere with existing public safety telecommunications, AM band and FM band radio broadcast, TV, Police Communication, HAM Radio communications and other signals in the area.

Worst Case Power Density for installation on Tower @ 179 Shunpike Rd, Cromwell, CT

Region 11 - Connecticut
Power Density Calculation - Worst Case

Base Station TX output	20	W	43.01	
Number of channels	4			
Antenna Model	EMS: RR-90-17/ RV-90-17			
Antanna Gain	16.5	dBi		
Cable Size	1 5/8"			
Cable Length	135	ft		
Jumper & Connector loss	1.5	dB		
Cable Loss per foot	0.0116			
Total Cable Loss	1.566	dB		
Total Attenuation	3.066	dB		
Total EIRP per channel	56.44	dB	440.99	W
Total EIRP per sector	62.46	dB	1763.97	W
Ground Reflection	1.6			
Frequency	1930	MHz		
Antenna Height	125	ft	3810	cm
nsg	13.434			
Power Density (S) =	**0.0247679670677204**	**mW / cm^2**		
% MPE =	**2.4768%**			

Current % MPE = 1.45 %

Combined Total % MPE = 3.927 %

Equation Used :

$$S = \frac{(1000)(grf)^2(Power) * 10^{(nsg/10)}}{4\pi (R)^2}$$

Office of Engineering and Technology (OET) Bulletin 65, Edition 97-01, August 1997

VoiceStream WIRELESS

RECEIVED

JUN 19 2000

CONNECTICUT SITING COUNCIL

VOICESTREAM WIRELESS
100 Filley Street
Bloomfield, CT 06002
Phone: (860) 692-7100
Fax: (860) 692-7159

Fax Cover Sheet

To: Paul Araujo	Phone No:
Department:	Fax No: (820) 827-2950
From: Brendan Sharkey	Phone No:
	Fax No:
Date: 6/19/00	Pages: 13 (Including Cover Sheet)

Re: TS - VoiceStream - 99J - 00609

Paul -

This is the power density analysis currently on file with the Town of Cromwell from which we developed our power density. This was part of AT&T's application materials when they applied locally to build the tower -

Bell Labs
Innovations for Lucent Technologies

Lucent Technologies

An Analysis of the Radiofrequency Environment in the Vicinity of a Proposed Personal Communications Services Base Station Site CT-120: 179 Shunpike Road, Cromwell, Connecticut

Prepared by

Wireless & Optical Technologies Safety Department
Bell Laboratories
Murray Hill, New Jersey 07974-0636

Prepared for

Michael Murphy
AT&T Wireless Services
15 E. Midland Avenue
Paramus, New Jersey 07652

July 19, 1999

Table of Contents

An Analysis of the Radiofrequency Environment in the Vicinity of a Proposed Personal Communications Services Base Station Site CT-120: 179 Shunpike Road, Cromwell, Connecticut

Summary

This report is an analysis of the radiofrequency (RF) environment surrounding the AT&T Wireless Services personal communications services (PCS) facility proposed for installation in Cromwell, CT. The analysis includes contributions from co-located municipal services land mobile radio antennas. The analysis utilizes engineering data provided by AT&T Wireless together with well-established analytical techniques utilized for calculating the RF fields associated with PCS and land mobile radio antennas. Worst-case assumptions were used to ensure safe-side estimates, i.e., the actual values will be significantly lower than the corresponding analytical values. The maximum level of RF energy associated with each transmitting antenna was compared with the appropriate frequency-dependent exposure limit, and these individual comparisons were combined to ensure that the total RF environment is in compliance with safety guidelines.

The results of this analysis indicate that the *total* maximum level of RF energy in normally accessible areas surrounding the installation is below all applicable health and safety limits. Specifically, the maximum level of RF energy associated with *simultaneous and continuous operation of all co-located transmitters* will be less than 1.5% of the safety criteria adopted by the Federal Communications Commission as mandated by the Telecommunications Act of 1996. The Telecommunications Act of 1996 is the applicable Federal law with respect to consideration of the environmental effects of RF emissions in the siting of personal wireless facilities. The total maximum level of RF energy will also be less than 1.5% of the exposure limits of ANSI, IEEE, NCRP and the limits used by all states that regulate RF exposure.

1. Introduction

This report was prepared in response to a request from AT&T Wireless Services for an analysis of the radiofrequency (RF) environment in the vicinity of the proposed personal communications services (PCS) facility, and an opinion regarding the concern for public health associated with long-term exposure in this environment. The analysis includes contributions to the RF environment from operation of co-located land mobile radio antennas.

The Telecommunications Act of 1996[1] is the applicable *Federal law* with respect to consideration of environmental effects of RF emissions in the siting of wireless facilities. Regarding personal wireless services, e.g., PCS, Section 704 of the Telecommunications Act of 1996 states the following:

> "No State or local government or instrumentality thereof may regulate the placement, construction, and modification of personal wireless service facilities on the basis of the environmental effects of radio frequency emissions to the extent that such facilities comply with the Commission's regulations concerning such emissions."

Therefore, the purpose of this report is to ensure that the total RF environment associated with these co-located radio facilities complies with Federal Communications Commission (FCC) guidelines as required by the Telecommunications Act of 1996.

2. Technical Data

The proposed AT&T Wireless Services PCS antennas are to be mounted to a monopole located at 179 Shunpike Road in Cromwell, CT. Co-located at the installation are municipal services land mobile radio antennas. The transmit frequencies for these services are listed in Table 1.

The actual RF power propagated from a PCS antenna is usually less than 10 watts per transmitter (channel) and the actual *total* RF power is usually less than 200 watts per sector (assuming the maximum number of transmitters are installed and operate *continuously at maximum power*). The maximum power propagated from a land mobile radio antenna is usually less than 100 watts. These are extremely low power systems when compared with other familiar radio systems such as AM, FM, and television broadcast, which operate upwards of 50,000 watts. The attached figure, which depicts the electromagnetic spectrum, lists familiar uses of RF energy. Table 1 lists engineering specifications for the co-located installations.

3. Environmental Levels of RF Energy

The antennas used for PCS and land mobile radio propagate most of the RF energy in a relatively narrow beam (in the vertical plane) directed toward the horizon. The small amount of energy that is directed along radials below the horizon results in a RF environment directly under the antennas that is not remarkably different from the environment at points more distant.

For the case at hand, the maximal potential exposure levels associated with *simultaneous and continuous operation* of all co-located transmitters can be readily calculated at any point in a plane at any height above grade. Based on the information shown in Table 1, the maximum power densities associated with all co-located facilities are shown in Table 2 for 6 ft and 16 ft above grade. The values for 16 ft above grade are representative of the maximum power densities immediately outside the second floor of nearby buildings (assuming level terrain). The values in Table 2 are also shown as a percentage of the FCC's maximum permissible exposure (MPE)

values found in the Telecommunications Act of 1996 (specifically, in the FCC *Guidelines for Evaluating the Environmental Effects of Radiofrequency Radiation* [2]).

The power density values in Table 2 are the theoretical maxima that could occur and are not typical values. For example, the calculations include the effect of 100% field reinforcement from in-phase reflections. The assumption was also made that each transmitter operates continuously at maximum power. However, because of the variability in the number of calls being handled by a PCS system, the average power will be less than maximum and, hence, will be less than those values indicated in Table 2. Furthermore, the intermittent nature of the transmission from land mobile radio systems will result in time-weighted-average values that will be lower than those above. Experience has shown that the analytical technique used is extremely conservative. That is, actual power density levels have always been found to be smaller than the corresponding calculated levels even when extrapolated to maximum use conditions (all transmitters operating simultaneously at maximum power) [3]. Also, levels inside nearby homes and buildings will be lower than those immediately outside because of the high attenuation of common building materials at these frequencies and, hence, will not be significantly different from typical ambient levels.

4. Comparison of Environmental Levels with RF Safety Criteria

Table 2 shows the calculated maximal RF power density levels in the vicinity of the co-located antennas; Table 3 shows federal, state and consensus exposure limits for human exposure to RF energy at the frequencies of interest. Because the MPEs vary with frequency, the calculated RF levels for each transmitting antenna must first be compared with the appropriate MPE (the individual percentages are shown in Table 2) and then these comparisons combined before compliance with safety guidelines can be shown. With respect to FCC limits for public exposure, comparisons of the weighted and combined analytical results indicate that the maximal levels associated with these antennas is at least 66 times below the MPE, i.e., less than 1.5% of the MPE.

5. Discussion of Safety Criteria

Publicity given to speculation about possible associations between health effects and exposure to magnetic fields from electric-power distribution lines, electric shavers and from the use of hand-held cellular telephones has heightened concern among some members of the public about the possibility that health effects may be associated with any exposure to electromagnetic energy. Many people feel uneasy about new or unfamiliar technology and often want absolute proof that something is safe. Such absolute guarantees are not possible since it is virtually impossible to prove that something does not exist. However, sound judgments can be made as to the safety of a physical agent based on the weight of the pertinent scientific evidence. This is exactly how safety guidelines are developed.

The overwhelming weight of scientific evidence unequivocally indicates that biological effects associated with exposure to RF energy are threshold effects, i.e., unless the exposure level is sufficiently high the effect will not occur regardless of exposure duration. (Unlike ionizing radiation, e.g., X-rays and nuclear radiation, repeated exposures to low level RF radiation, or nonionizing radiation, are not cumulative.) Thus, it is relatively straightforward to derive safety limits. By adding safety factors to the threshold level at which the most sensitive effect occurs, conservative exposure guidelines have been developed to ensure safety.

At present, there are more than 10,000 reports in the scientific literature which address the subject of RF bioeffects. These reports, most of which describe the results of epidemiology studies, animal and cell-culture studies, have been critically reviewed by leading researchers in the field and all

new studies are continuously being reviewed by various groups and organizations whose interest is developing health standards. These include the U.S. Environmental Protection Agency, the National Institute for Occupational Safety and Health, the National Council on Radiation Protection and Measurements, the standards committees sponsored by the Institute of Electrical and Electronics Engineers, the International Radiation Protection Association under the sponsorship of the World Health Organization, and the National Radiological Protection Board of the UK. All of these groups have recently either reaffirmed existing health standards, developed and adopted new health standards, or proposed health standards for exposure to RF energy.

For example, in 1986, the National Council on Radiation Protection and Measurements (NCRP) published recommended limits for occupational and public exposure[4]. These recommendations were based on the results of an extensive critical review of the scientific literature by a committee of the leading researchers in the field of bioelectromagnetics. The literature selected included many controversial studies reporting effects at low levels. The results of all studies were weighed, analyzed and a consensus obtained establishing a conservative threshold upon which safety guidelines should be based. This threshold corresponds to the level at which the most sensitive, reproducible effects that could be related to human health were reported in the scientific literature. Safety factors were incorporated to ensure that the resulting guidelines would be at least ten to fifty times lower than the established threshold, even under worst-case exposure conditions. The NCRP recommended that continuous occupational exposure or exposure of the public should not exceed approximately those values indicated in Table 3. (See Table 3 for a summary of the corresponding safety criteria recommended by various organizations throughout the world.)

In July of 1986, the Environmental Protection Agency published a notice in the Federal Register, calling for public comment on recommended guidance for exposure of the public[5]. Three different limits were proposed. In 1987 the EPA abandoned its efforts and failed to adopt official federal exposure guidelines. However, in 1993 and 1996 the EPA, in its comments on the FCC's Notice of Proposed Rule Making to adopt safety guidelines[6], recommended adoption of the 1986 NCRP limits[4].

In September 1991, the RF safety standard developed by Subcommittee 4 of the Institute of Electrical and Electronics Engineers (IEEE) Standards Coordinating Committee SCC-28 was approved by the IEEE Standards Board[7]. (Until 1988 IEEE SCC-28 was known as the American National Standards Institute (ANSI) C95 Committee—established in 1959.) In November 1992, the ANSI Board of Standards Review approved the IEEE standard for use as an American National Standard. The limits of this standard are identical to the 1982 ANSI RFPGs[8] for occupational exposure and approximately one-fifth of these values for exposure of the general public at the frequencies of interest. Like those of the NCRP, these limits resulted from an extensive critical review of the scientific literature by a large committee of preeminently qualified scientists, most of whom were from academia and from research laboratories of federal public health agencies.

The panels of scientists from the World Health Organization's International Commission on Non-Ionizing Radiation Protection (ICNIRP)[9] and the National Radiological Protection Board in the United Kingdom[10] independently developed and in 1993 published guidelines similar to those of ANSI/IEEE. In 1997, after another critical review of the latest scientific evidence, ICNIRP reaffirmed the limits published in 1993[11]. Also, what was formerly the USSR, which traditionally had the lowest exposure guides, twice has revised upward its limits for public

exposure. Thus, there is a converging consensus of the world's scientific community as to what constitutes safe levels of exposure.

Finally, in implementing the National Environmental Policy Act regarding potentially hazardous RF radiation from radio services regulated by the FCC, the Commission's Rules require that licensees filing applications after January 1, 1997[1] ensure that their facilities will comply with the 1996 FCC MPE limits outlined in 47 CFR §1.1310[3][2]. (Under the terms of the Telecommunications Act of 1996, no local government may regulate the placement of wireless facilities based on RF emissions to the extent that these emissions comply with the FCC regulations [1].)

With respect to the co-located antennas, be assured that the actual exposure levels in the vicinity of the Cromwell, CT installation will be below any health standard used anywhere in the world and literally thousands of times below any level reported to be associated with any verifiable functional change in humans or laboratory animals. This holds true even when all transmitters operate *simultaneously and continuously at their highest power*. Power density levels of this magnitude are not even a subject of speculation with regard to an association with adverse health effects.

6. For Further Information

Anyone interested can obtain additional information about the environmental impact of personal wireless services from:

Dr. Robert Cleveland, Jr.
Federal Communications Commission
Office of Engineering and Technology
Room 7002
2000 M Street NW
Washington, DC 20554
(202) 418-2422

7. Conclusion

This report is an analysis of the radiofrequency (RF) environment surrounding the AT&T Wireless Services personal communications services (PCS) facility proposed for installation in Cromwell, CT. The analysis includes contributions from co-located municipal services land mobile radio antennas. The analysis utilizes engineering data provided by AT&T Wireless together with well-established analytical techniques utilized for calculating the RF fields associated with PCS and land mobile radio antennas. Worst-case assumptions were used to ensure safe-side estimates, i.e., the actual values will be significantly lower than the corresponding analytical values. The maximum level of RF energy associated with each transmitting antenna was compared with the appropriate frequency-dependent exposure limit, and these individual comparisons were combined to ensure that the total RF environment is in compliance with safety guidelines.

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1. The FCC extended the transition period to October 15, 1997. Second Memorandum Opinion and Order and Notice of Proposed Rulemaking, ET Docket 93-62, FCC 97-303, adopted August 25, 1997. Prior to this date the FCC required most licensees to comply with 1982 ANSI C95.1 limits.

2. Although all FCC licensees will be required to comply with 47 CFR §1.1310 limits, the FCC will continue to exclude certain land mobile services from proving compliance with these limits 47 CFR §1.1307. Previously, although licensees had to comply with the 1982 ANSI C95.1 limits, the FCC categorically excluded land mobile services, including paging, cellular, ESMR and two-way radio, from hazard analyses because "individually or cumulatively they do not have a significant effect on the quality of the human environment"[12]. The FCC pointed out that there was no evidence of excessive exposure to RF radiation during routine normal operation of these radio services.

The results of this analysis indicate that the *total* maximum level of RF energy in normally accessible areas surrounding the installation is below all applicable health and safety limits. Specifically, the maximum level of RF energy associated with *simultaneous and continuous operation of all co-located transmitters* will be less than 1.5% of the safety criteria adopted by the Federal Communications Commission as mandated by the Telecommunications Act of 1996. The Telecommunications Act of 1996 is the applicable Federal law with respect to consideration of the environmental effects of RF emissions in the siting of personal wireless facilities. The total maximum level of RF energy will also be less than 1.5% of the exposure limits of ANSI, IEEE, NCRP and the limits used by all states that regulate RF exposure.

8. References

[1] Telecommunications Act of 1996, Title VII, Section 704, *Facilities Siting; Radio Frequency Emissions Standards*

[2] Federal Communication Commission 47 CFR Parts 1, 2, 15, 24 and 97. "*Guidelines for Evaluating the Environmental Effects of Radiofrequency Radiation.*" (August 6, 1996)

[3] Petersen, R.C., and Testagrossa, P.A., "Radiofrequency Fields Associated with Cellular-Radio Cell-Site Antennas," *Bioelectromagnetics*, Vol. 13, No. 6. (1992)

[4] *Biological Effects and Exposure Criteria for Radio Frequency Electromagnetic Fields.* NCRP Report No. 86, National Council on Radiation Protection and Measurements, Bethesda, MD. (1986)

[5] Federal Register, Vol. 51, No. 146, Wednesday, July 30, 1986.

[6] Notice of Proposed Rule Making *In the Matter of Guidelines for Evaluating the Environmental Effects of Radiofrequency Radiation*, August 13, 1993. ET Docket No. 93-62

[7] *IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz.* ANSI/IEEE C95.1-1992, Institute of Electrical and Electronics Engineers, Piscataway, NJ. (1991)

[8] American National Standard *Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 300 kHz to 100 GHz,* ANSI C95.1-1982, American National Standards Institute, New York, NY. (1982)

[9] *Electromagnetic Fields (300 Hz to 300 GHz).* Environmental Health Criteria 137, World Health Organization, Geneva, Switzerland. (1993)

[10] *Board Statement on Restrictions on Human Exposure to Static and Time Varying Electromagnetic Fields and Radiation.* Documents of the NRPB, Vol. 4, No. 5, National Radiological Protection Board, Chilton, Didcot, Oxon, United Kingdom. (1993)

[11] "Guidelines for Limiting Exposure to Time-Varying Electric, Magnetic, and Electromagnetic Fields (up to 300 GHz) - ICNIRP Guidelines," *Health Physics*, Vol. 74, No. 4, pp. 494-522. (1998)

[12] Action by the Commission February 12, 1987, by Second Report and Order (FCC 87-63), and Third Notice of Proposed Rulemaking (FCC 87-64). General Docket No. 79-144.

Enclosure: Figure. Electromagnetic Spectrum

Table 1: Engineering Specifications for the Co-Located Radio Systems, Cromwell, CT

Site Specifications	AT&T Wireless	Police Department Land Mobile Radio	Fire Department Land Mobile Radio	Fire Department Land Mobile Radio	Fire Department Alarm System
transmit frequency	1930 - 1990 MHz	800 MHz	46 MHz	154 MHz	460 MHz
maximum ERP† per channel	100 watts	635 watts	100 watts	110 watts	500 watts
actual radiated power per channel	4 watts	100 watts	100 watts	40 watts	150 watts
actual *total* radiated power	32 watts per sector	100 watts*	100 watts*	40 watts*	150 watts*
number of transmit/receive antennas	N/A	2	4	6	2
number of transmit antennas	1 per sector	N/A	N/A	N/A	N/A
number of receive antennas	2 per sector	N/A	N/A	N/A	N/A
maximum number of transmitters	8 per sector	2*	4*	6*	2*
number of sectors configured	3	N/A (omni)	N/A (omni)	N/A (omni)	N/A (omni)
minimum antenna centerline height above grade	158 ft	159 ft	128 ft	135 ft	127 ft
antenna manufacturer	Allgon	TXRX Systems	Celwave	Celwave	Celwave
model number	7184.14	101-90-08-5-01	PD1142	PD620	PD201
gain	16.15 dBi	10.16 dBi	2.15 dBi	6.45 dBi	7.15 dBi
type	directional	omni	omni	omni	omni
downtilt	2°	5° (maximum)	0°	0°	0°

† *Effective Radiated Power* - ERP is a measure of how well an antenna concentrates RF energy; it is not the actual power radiated from the antenna. To illustrate the difference, compare the brightness of an ordinary 100 watt light bulb with that from a 100 watt spot-light. Even though both are 100 watts, the spot-light appears brighter because it concentrates the light in one direction. In this direction, the spot-light effectively appears to be emitting more than 100 watts. In other directions, there is almost no light emitted by the spot-light and it effectively appears to be much less than 100 watts.

* Although there are multiple RF channels available for the system, only a single channel is transmitting at any one time.

Table 2: Calculated Maximal Levels and the Levels as a Percentage of 1996 FCC MPEs* for the Co-Located Antennas, Cromwell, CT

Provider	Power Density ($\mu W/cm^2$)		% of MPEs*	
	6 ft AMGL†	16 ft AMGL†	6 ft AMGL†	16 ft AMGL†
AT&T Wireless Services	< 0.12	< 0.14	0.02%	0.02%
Police - 800 MHz	< 3.06	< 3.51	0.62%	0.64%
Fire - 46 MHz	< 0.95	< 1.13	0.48%	0.57%
Fire - 154 MHz	< 0.15	< 0.17	0.08%	0.09%
Fire - 460 MHz	< 0.32	< 0.38	0.11%	0.13%
		TOTAL	1.31%	1.45%

* MPE: The FCC limits for maximum permissible exposure (same as 1986 NCRP limits at the frequencies of interest)

† AMGL: above mean grade level

1.45%
2.477
3.927

Table 3: Summary of International, Federal, State and Consensus Safety Criteria for Exposure to Radiofrequency Energy Used for Radio Communications Systems (300 - 2000 MHz)

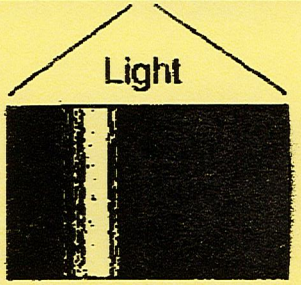
Organization/Government Agency	Exposure Population	Power Density ($\mu W/cm^2$)
International Safety Criteria/Recommendations		
International Commission on Non-Ionizing Radiation Protection (1997)	Occupational	$f/0.4$[1]
(*Health Physics* 74:4, 494-522, (1998)[2]	Public	$f/2$
National Radiological Protection Board (United Kingdom)	Occupational	5000[3]
(NRPB, 1993)	Public	2600[3]
Federal Requirements		
Federal Communications Commission	Occupational	$f/0.3$
(47 CFR §1.1310)	Public	$f/1.5$
Consensus Standards and Recommendations		
American National Standards Institute	Occupational	$f/0.3$
(ANSI C95.1 - 1982)	Public	$f/0.3$
Institute of Electrical and Electronics Engineers	Occupational	$f/0.3$
(ANSI/IEEE C95.1-1999 Edition)[4]	Public	$f/1.5$
National Council on Radiation Protection & Measurements	Occupational	$f/0.3$
(NCRP Report 86, 1986)	Public	$f/1.5$
State Codes		
New Jersey (NJAC 7:28-42)	Public	$f/0.3$
Massachusetts (Department of Health 105 CMR 122)	Public	$f/1.5$
New York State[5]	Public	$f/1.5$

NOTES:

1. f = frequency in MHz
2. Reaffirmed in 1997 and published, with modification, in 1998.
3. The NRPB guidelines have slightly different frequency ranges for their investigation levels. The values shown are the lowest values for the corresponding frequency range.
4. Incorporating IEEE Standard C95.1-1991 and IEEE Standard C95.1a-1998.
5. State of New York Department of Health follows NCRP Report 86.

ELECTROMAGNETIC SPECTRUM

Non-Ionizing Radiation | Ionizing Radiation



AM Radio: *535 - 1605 kHz*
CB Radio: *27 MHz*
Cordless Phones: *49 MHz*
TV Ch 2-6: *54 - 88 MHz*
FM Radio: *88 - 108 MHz*
Marine Radio: *160 MHz*
TV Ch 7-13: *174 - 216 MHz*
TV UHF Ch 14-69: *470 - 800 MHz*
Cellular Radio, Specialized Mobile Radio, Paging: *806 - 946 MHz*
Antitheft devices: *10-20 kHz and/or 915 MHz*
Microwave oven: *915 and 2450 MHz*
Personal Communication Services: *1800 - 2200 MHz*
Intrusion alarms / door openers: *10.5 GHz*
Microwave radio: *1 - 40 GHz*
Satellite Communications: *100 MHz - 275 GHz*