DOCKET FILE COPY ORIGINAL

Date: September 23, 1996

NOTE TO THE RECORD (WT Docket No. 96-86) --

Per the instructions of Philip L. Verveer of Willkie Farr & Gallagher, Chair of the Public Safety Wireless Committee: the attached pages were substituted into the Final Report of the Public Safety Wireless Advisory Committee, dated September 11, 1996.

Robert H. McNamara
Chief, Private Radio Division
Wireless Telecommunications Bureau
Federal Communications Commission

LIST OF ACRONYMS

AASHTO	American Association of State Highway and Transportation Officials
ACCOLC	Access Overload Class
ADP	Automated Data Processing
AFCEA	Armed Forces Communications and Electronics Association
AHS	Automated Highway System
ALARS	Automobile License and Registry System
ALI	Automatic Location Identification
AMPS	Advanced Mobile Phone System
AMSC	American Mobile Satellite Corporation
ANI	Automatic Number Identification
ANSI	American National Standards Institute
APCO	Association of Public Safety Communications Officials - International, Inc.
API	American Paging, Inc.
APL	Automatic Personnel Location
ARQ	Automatic repeat ReQuest
AT&T	American Telephone and Telegraph
ATM	Asynchronous Transfer Mode
ATV	Advanced Television (HDTV)
AVC	Automatic Vehicle Classification
AVI	Automatic Vehicle Identification
AVL	Automatic Vehicle Location
AVM	Automatic Vehicle Monitoring
AWGN	Additive White Gaussian Noise
BER	Bit Error Rate
BIFC	Boise Inter-agency Fire Cache
BPA	Bonneville Power Administration
BTA	Basic Trading Area
CAD	Computer-Aided Dispatch
CAI	Common Air Interface
CAP	Competitive Access Provider
CBP	Community Based Policing
CCITT	Consultative Committee on International Telephony and Telegraphy
CD-ROM	Compact Disk - Read Only Memory
CDF	California Department of Forestry and Fire Protection
CDMA	Code Division Multiple Access
CDPD	Cellular Digital Packet Data
CELP	Coded Excited Linear Predictive
CFR	Code of Federal Regulations
CGSA	Cellular Geographic Service Area
CHP	California Highway Patrol
CLEC	Competitive Local Exchange Carrier
CMRS	Commercial Mobile Radio Services

FLEWUG	Federal Law Enforcement Wireless Users Group
FM	Frequency Modulation
FMARS	Fire Mutual Aid Radio System
FPLMTS	Future Public Land Mobile Telecommunications Systems
FQPSK	Feher's Quadrature Phase Shift Keying
FRS	Fire Radio Service
GETS	Government Emergency Telecommunications System
GHz	Gigahertz
GIF	Graphic Image Format
GIS	Geographic Information System
GLONASS	Global Navigation Satellite System
GMF	Government Master File
GMSK	Gaussian Minimum Shift Keying
GOS	Grade of Service
GPS	Global Positioning System
HAZMAT	Hazardous Materials
HDTV	High Definition Television (ATV)
HF-SSB	High-frequency Single-sideband
HIDTA	High Intensity Drug Trafficking Area
HMRS	Highway Maintenance Radio Service
HOV	High Occupancy Vehicle
IACP	International Association of Chiefs of Police
IAFC	International Association of Fire Chiefs
IAFIS	Integrated Automated Fingerprint Identification System
IC	Integrated Circuit; Incident Commander
ICO	Intermediate Circular Orbit
ICP	Interoperability Communication Plan
ICS	Incident Command System
ICSAR	Interagency Committee on Search and Rescue
iDEN	Integrated Digital Electronic Network
IEEE	Institute of Electrical and Electronics Engineers
IMO	International Maritime Organization
IMSA	International Municipal Signal Association
IMTS	Improved Mobile Telephone Service
INMARSAT	International Maritime Satellite Organization
INS/CECOM	Immigration and Naturalization Service/U.S. Army Communications and Electronics Command
IOC	Initial Operating Capability
IP	Internet Protocol
IPR	Intellectual Property Right
IRAC	Interdepartment Radio Advisory Council
ISC	Interoperability Subcommittee
ISO	International Standards Organization

ISTEA	Intermodal Surface Transportation Efficiency Act
ITS	Intelligent Transportation Systems
ITU	International Telecommunication Union
IVHS	Intelligent Vehicle and Highway Systems
JPEG	Joint Photographic Expert Group
JSMS	Joint Spectrum Management System
KB/S (KBPS)	Kilobytes per Second
KHz	Kilohertz
LAN	Local Area Network
LATA	Local Access Transport Area
LEO	Low Earth Orbit
LGRS	Local Government Radio Service
LMCC	Land Mobile Communications Council
LMR	Land Mobile Radio
LMS	Location and Monitoring Service
LOGIS	Local Government Information System
LPD	Low Probability of Detection
LPI	Low Probability of Intercept
MAP	Mutual Aid Plan
MARISAT	Maritime Satellite
MDT	Mobile Data Terminals
MHz	Megahertz
MMST	Metropolitan Medical Strike Team
MPEG	Motion Picture Expert Group
MPEG-1	Motion Picture Expert Group
MPEG-4	Motion Picture Expert Group
MSA	Metropolitan Statistical Area
MSC	Mobile Switching Center
MSS	Mobile Satellite Systems
MTA	Major Trading Area
MTA-NYCT	Metropolitan Transportation Authority - New York City Transit
MTBF	Mean Time Between Failure
MTSO	Mobile Telephone Switching Office
NAM	Number Assignment Module
NASNA	National Association of State Nine-One-One Administrators
NASTD	National Association of State Telecommunications Directors
NATO	North Atlantic Treaty Organization
NCIC	National Crime Information Center
NCIC-2000	National Crime Information Center Project 2000
NENA	National Emergency Number Association
NFPA	National Fire Protection Association

NIRSC	National Incident Radio Support Cache
NIST	National Institute of Standards and Technology
NITF	National Image Transfer Format
NLETS	National Law Enforcement Telecommunications System
NPR	National Performance Review
NPSPAC	National Public Safety Planning Advisory Committee
NSA	National Security Agency
NSEP	National Security and Emergency Preparedness
NSTAC	National Security Telecommunications Advisory Committee
NTIA	National Telecommunications and Information Administration
NTIAOA	National Telecommunications and Information Administration Organization Act
NTSC	National Television Systems Committee
NTSC	National Television Systems Committee
NTT	Nippon Telegraph and Telephone Corp.
NYCDoITT	New York City Department of Information, Technology, and Telcommunications
OASD	Office of the Assistant Secretary of Defense
OIC	Officer-In-Charge
OMS	Operations and Management Systems
ORBCOMM	Orbital Communications
ORSC	Operational Requirements Subcommittee
OTAR	Over The Air Rekey
PACA	Priority Access and Channel Assignment
PBX	Private Branch Exchanges
PCS	Personal Communications Services
PDA	Personal Digital Assistant
PDT	Portable Data Terminal
PLMR	Private Land Mobile Radio
PMARS	Police Mutual Aid Radio System
PMO	Program Management Office
POTS	Plain Old Telephone System
PPM	Parts Per Million
PRS	Police Radio Service
PSA	Protected Service Area
PSAM	Pilot Symbol Assisted Modulation
PSAP	Public Safety Answering Point
PSCC	Public Safety Communications Council
Ψ(psi)-CELP	Ψ (psi) Coded Excited Linear Predictive
PSRS	Public Safety Radio Services
PSTN	Public Switched Telephone Network
PSWAC	Public Safety Wireless Advisory Committee
PSWN	Public Safety Wireless Network
QPSK	Quadrature Phase Shift Keying

Investigation; the Honorable Howard Safir, Police Commissioner of the City of New York [William Bratton served until his resignation in the Spring of 1996]; the Honorable Michael Freeman, Fire Chief of Los Angeles County, California; the Honorable Alan D. Bersin, United States Attorney for the Southern District of California; Raymond W. Kelly, Undersecretary for Enforcement, Department of the Treasury [Ronald K. Noble served until his resignation in 1996] ; Harlin McEwen, Deputy Assistant Director, Federal Bureau of Investigation and senior official of the International Association of Chiefs of Police; Cindy Raiford, Deputy Director of Communications, Department of Defense; Steven Proctor, Technical Manager for Communications, State of Utah and past president of the Association of Public Safety Communications Officials International, Inc.; Dennis Connors, Vice President, Ericsson, Inc.; and Fred Kuznik, Vice President, Motorola, Inc.[8] The Advisory Committee was chartered to:

1.10.1 ▸ Advise the FCC and NTIA of specific operational wireless needs of the community including improvement of basic voice, data and E9-1-1 services, and the implementation of new wide-area, broadband telecommunications technologies for transmission of mugshots, fingerprints, video, and other high-speed data.

1.10.2 ▸ Advise the NTIA and FCC on options to provide for greater interoperability among federal, state, and local Public Safety entities.

1.10.3 ▸ Advise the FCC and NTIA on options to accommodate growth of basic and emerging services, including bandwidth vs. functional requirement trade-offs, technical options, and other options.

1.10.4 ▸ Advise the NTIA and FCC on the total spectrum requirements for the operational needs referred to above, including frequency band options, shared/joint spectrum use options, and other options.[9]

Structure of the Committee

1.11 The PSWAC consists of a Steering Committee and five (5) functional subcommittees. The Steering Committee exercised overall direction of the work of the subcommittees

---

[8] Several members of the Steering Committee were represented on occasion by alternates. The alternates for the members of the Steering Committee of the Advisory Committee are: Tyrel W. Hayton, Federal Bureau of Investigation, for Director Freeh; Michael Amarosa, Deputy Commissioner for Technology and Systems Development, Police Department of the City of New York, for Commissioner Safir; Raymond A. Barnett, United States Secret Service, Department of the Treasury, for Undersecretary Kelly; and Debra A. Gross, Commander, USN, Office of the Assistant Secretary of Defense Command, Control, Communications and Intelligence, for Deputy Director Raiford.

[9] Charter of the Public Safety Wireless Advisory Committee (filed June 26, 1995).

and was responsible for reviewing their output. The subcommittees were created to address specific areas of concern:

Table 1-1

Operational Requirements Subcommittee ***(ORSC)***	The Operational Requirements Subcommittee was chaired by Mr. Paul H. Wieck, Commissioner, Iowa Department of Public Safety. The alternate for Commissioner Wieck was Mr. Craig Allen, Lieutenant, Illinois State Police. This subcommittee was charged with identifying the communication needs of the Public Safety community to the year 2010. It focused on requirements that are currently unmet or suffer from reliability, quality, or coverage deficiencies. The subcommittee also examined the new services being made available by advances in both wide- and narrowband technology.
Technology Subcommittee ***(TESC)***	The Technology Subcommittee was chaired by Mr. Alfred Mello, Chairman of the Public Safety Communications Council. The alternate for Mr. Mello was Mr. Richard DeMello, Forestry Conservation Communications Association. This subcommittee reviewed the technologies now used by Public Safety and identified the emerging technologies that may serve Public Safety agencies' needs in the future. A special focus was on those technologies that offer advances in spectral efficiency or new services to meet the community's growing needs.
Interoperability Subcommittee ***(ISC)***	The Interoperability Subcommittee was chaired by Mr. James E. Downes of the U.S. Department of Treasury. This subcommittee defined "Public Safety" and "interoperability" for purposes of the *Final Report* and examined the specific problems of interoperability between Public Safety agencies. The group detailed the needs for interoperability among and between Public Safety agencies and the varying circumstances in which it must be available.
Spectrum Requirements Subcommittee ***(SRSC)***	The Spectrum Requirements Subcommittee was chaired by Mr. Richard N. Allen of the Federal Bureau of Investigation. Based on the work of the above subcommittees, this subcommittee was charged with determining the specific spectrum requirements that will need to be met in order for Public Safety agencies to perform their missions in the most effective manner. It evaluated current spectrum allocations and usage, and made recommendations on future allocations and use.

Table 1-1

Transition Subcommittee (TRSC)	The Transition Subcommittee was chaired by Mr. James R. Rand, Executive Director of the Association of Public Safety Communications Officials International, Inc. The alternate for Mr. Rand was Mr. Ali Shahnami, Association of Public Safety Communications Officials International, Inc. The assistant to Mr. Rand was Mr John Ramsey, also of the Association of Public Safety Communications Officials International, Inc. This subcommittee was charged with examining the mechanisms necessary to improve Public Safety wireless communications over the next 15 years. The subcommittee addressed spectrum management practices, funding alternatives, and regulatory changes necessary to effect the goals of the Advisory Committee.

1.12 The meetings of the Steering Committee and the subcommittees were open to the public. Steering Committee and subcommittee meetings were held in various locations around the country to encourage maximum public participation. Over 480 individuals, representing all areas of the manufacturing, service, the Public Safety user communities, and the general public participated in the work of the subcommittees.

1.13 The drafting of the *Final Report* was supervised by Michael Amarosa, Deputy Commissioner for Technology and Systems Development, Police Department of the City of New York; Raymond A. Barnett, United States Secret Service, Department of the Treasury; and Steven Proctor, Technical Manager for Communications of the State of Utah and past president of the Association of Public Safety Communications Officials International, Inc.

The PSWAC *Final Report*

1.14 This *Final Report* of PSWAC to the FCC and NTIA represents the views of the PSWAC Steering Committee. The *Final Report* is predicated upon the work of the subcommittees, but departs from the various subcommittee reports in some respects. It examines the problems confronting the Public Safety community now and identifies the wireless communication needs of the community to the year 2010. The *Final Report* also discusses the technologies available, now and in the future, to meet those needs, the spectrum and interoperability requirements of the community, and the transition mechanisms that will be required to bring Public Safety communications up to expected levels of performance, efficiency, and effectiveness. The recommendations embodied in this report are advanced with varying degrees of certitude. Some, especially those susceptible to near term implementation, are quite specific. Some are more general. Overall, they represent the Steering Committee's collective judgement with respect to changes necessary to maintain and improve Public Safety communications functions in the United States. The work of each subcommittee

active conversation.[19] Realistically, this high level of efficiency could only be achieved by universal replacement of existing equipment with more spectrum efficient equipment and the widespread deployment of Public Safety systems more spectrum efficient than any on the market today or required by the FCC's *Refarming* docket. To put this requirement in perspective, assuming that the older one fourth of installed equipment in 2010 operates with a spectrum efficiency of 12.5 kHz per active conversation (the level required for new type acceptances today under the FCC's *Refarming* rules, but not yet in significant use in Public Safety), if the SRSC's forecasts are to be met, the other three-quarters of equipment must operate with a spectrum efficiency of 1.17 kHz per active conversation -- roughly *twenty* times more efficient than today's typical practice. Other forecasts were similarly aggressive in other areas such as data modulation, video coding improvement, *etc.* Notably however, the SRSC's model predictions are consistent with the FCC's 1985 staff study on Public Safety spectrum needs and other, more recent, studies by the NTIA, the Coalition of Private Users of Emerging Multimedia Technologies, and the Association of Public Safety Communications Officials International, Inc., in that all agree that additional spectrum for Public Safety services is necessary.[20]

Specific Findings

4.4.11 Recognizing that Public Safety telecommunications infrastructure (e.g., fixed microwave systems) are vital to the operation of area-wide systems, the SRSC recommends that 161 MHz of additional allocations be made for this use. This figure was derived through analysis, recognizing that although landline technology, including fiber optics, offers increasing telecommunications capacity and can be used to off-load communications from spectrum-dependent systems, certain areas of the country that are susceptible to earthquakes cannot rely on ground-dependent systems since those systems often fail during severe earth movements. The SRSC expects that the future supply of backbone system elements will look much like the past, but with two major exceptions. First, the lowest microwave frequencies (2 GHz) are no longer available for backbone systems.[21] Second, the supply of facilities by local carriers historically has been limited to only one firm, the local telephone company. Changes in law and technology, however, have led to the entry of new competitors in many markets and the probability of extensive further entry.

---

19 The value of 4 kHz per voice channel is based on an offered load of 6 kb/s for digitized voice today, and by the year 2010, an improvement in coding of 2:1, the use of error correcting code and overhead that requires double the offered load, and a transmitted rate (or modulation efficiency) of 1.5 b/s/Hz.

20 *Report on Future Public Safety Telecommunications Requirements*, Notice of Inquiry in P.R. Docket No. 84-232, 49 Fed. Reg. 9754 (March 15, 1984); *NTIA Spectrum Requirements Study*, Land Mobile Spectrum Planning Options, (October 19, 1995); *Petition for Rulemaking of the Coalition of Private Users of Emerging Multimedia Technologies* (filed December 23, 1993); *Public Safety Spectrum Needs Analysis and Recommendation* (Assoc. of Public Safety Comm. Officials International, Inc. 1994).

21 This spectrum was reallocated for Personal Communications Systems.

SEPARATE STATEMENT
OF
ERICSSON, INC.

Ericsson, Inc. has been pleased to serve and participate in the Public Safety Wireless Advisory Committee (Advisory Committee or PSWAC). Through the PSWAC process, the Federal Communications Commission (FCC) and the National Telecommunications and Information Administration (NTIA) set in motion a proceeding designed to address the present deficiencies in public safety wireless communications, solutions to those deficiencies, and to quantify the extent of need for additional spectrum for public safety purposes.

Ericsson would like to recognize and applaud the wide variety of representatives of the public safety community that have participated in this worthwhile process. They have spent countless hours identifying the operational needs of various public safety agencies, the host of emerging technologies that are and will be available for use by public safety agencies, the interoperability requirements of the public safety community, and the need for additional spectrum if public safety agencies are to fulfill their current and future responsibilities. Ericsson representatives have participated in all the formal meetings of the PSWAC and its various Subcommittees, and fully support the key findings of the PSWAC Final Report.

Ericsson is concerned, however, that the PSWAC Final Report fails to acknowledge the unanimous consensus reached in the Interoperability Subcommittee that the minimum baseline technology for interoperability for unit-to-unit voice communications should be analog FM. The PSWAC Final Report merely recognizes that "a minimum baseline standard is required for unit-to-unit Public Safety radio equipment operating in the same band."

Ericsson believes that the use of analog FM as a common mode of operation for interoperability has many advantages and should have been specified in the PSWAC Final Report as the short-term solution for interoperability. Analog FM is backward compatible with the vast majority of the embedded base of public safety radio equipment and, thus, can easily be implemented. Further, analog FM radio technology is unencumbered by Intellectual Property Rights. Many manufacturers could, therefore, produce compliant equipment with little concern about infringing upon patents and copyrights held by others. This technology also fulfills the FCC's goal to stimulate competition in the public safety equipment market by lowering the barriers of the entry to all into the market.

There are other benefits to using analog FM as the common mode for interoperability. Most importantly, perhaps, is that a baseline standard based on analog FM technology provides a common mode of operation that offers an immediate interoperability solution that can be incorporated into all public safety communications systems. Hence, the Interoperability Subcommittee went beyond merely recommending that a minimum baseline standard be established and specifically endorsed that the standard be analog FM for operation on public safety mutual aid/interoperability channels. Ericsson strongly believes that the PSWAC Final Report should also have recognized the benefits of using analog FM technology as an immediate short-term baseline standard for interoperability for public safety agencies.

Ericsson believes the language that "a minimum baseline standard is required for unit-to-unit Public Safety radio equipment" (see 2.2.11.1) does not differentiate between the short term and long term interoperability solutions of the Interoperability Subcommittee Final Report. The Interoperability Subcommittee did define that future interoperability solutions would embrace digital technology. Indeed, the PSWAC Final Report states "digital technology will be the key technology for the future." (See 2.1.22) However, the Interoperability Subcommittee Final Report concluded that the definition of a digital standard for interoperability was outside the scope of PSWAC and would be undertaken in a future effort.

The PSWAC Final Report also states that any "standards and connections should be developed by a fair and open process that encourages industry to cooperate in order to provide the tools and technology needed by the Public Safety community." (See 2.2.11.3) Ericsson agrees that any future effort to develop standards for public safety equipment must be done by an open and fair process.

However, history has shown that past efforts to develop standards for public safety equipment have negatively impacted competition in the public safety equipment marketplace. (See *Notice of Proposed Rule Making, In the Matter of The Development of Operational, Technical, and Spectrum Requirements for Meeting Federal, State and Local Public Safety Agency Communication Requirements Through the Year 2010, FCC 96-155, WT Docket No. 96-86* (April 10, 1996); see also *A Need to Be Heard: Will Project 25 Meet Public Safety Communications Needs in 1995 and Beyond*, Charles L. Jackson, Strategic Policy Research (July 1995), and *Competitive Considerations Associated With APCO 25*, Hatfield Associates, Inc. (January 1996).)

Economic literature associated with standard setting suggests that care must be taken to assure that the consequences do not have significant adverse competitive effects. Because of the problems associated with past standard setting efforts in the public safety communications equipment market, Ericsson suggested that any future standard setting efforts be done by an accredited standard setting organization. Consensus could not be reached on Ericsson's suggestion.

Alternatively, Ericsson suggested that if such standards were to be developed by a non-accredited standard setting organization, that requirements similar to those established by the United States Congress in Sections 273(d)(4) and (5) of the Telecommunications Act of 1996 (citation) be established to govern the procedures of such non-accredited standard setting organization. Here, again, consensus could not be reached on Ericsson's suggestion.

Ericsson's approach regarding any future standards for a digital interoperability standard is fair to all parties. The American National Standards Institute (ANSI) places certain requirements on organizations that sponsor formal standards. These requirements ensure openness and fairness in addition to a degree of due process for the participants in the standards-making activity.

Likewise, Sections 273(d)(4)(1) through (5) of the Telecommunications Act of 1996 set forth similar requirements that must be followed by any entity that is not an accredited standards development organization that undertakes proceedings that establishes industry-wide standards for telecommunications equipment.

In developing a future digital interoperability standard for public safety, Ericsson believes that the process should be fair and open. The only assurance that the process will be truly fair is the use of an ANSI-accredited organization or, alternatively, by a non-accredited standard setting entity operating in compliance with procedures similar to those adopted by Congress in Sections 273(d)(4)(1) through (5).

In conclusion, Ericsson believes that the PSWAC Final Report should have specifically stated:

(1) that the analog FM standard be defined as the short-term interoperability solution for public safety; and

(2) that any future standards, analog or digital, should be adopted by an ANSI-accredited organization or, alternatively, if undertaken by a non-accredited organization, that the Federal Communications Commission should adopt rules requiring such entities to operate pursuant to open and fair procedures similar to those adopted by Congress in Sections 273(d)(4) and (5) of the Telecommunications Act of 1966.