

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of)
)
RESPONSE EFFORTS UNDERTAKEN) **ET Docket No. 17-344**
DURING THE 2017 HURRICANE SEASON)

**To: The Chief, Public Safety and
Homeland Security Bureau**
Via: ECFS Electronic Filing

**COMMENTS OF ARRL, THE NATIONAL ASSOCIATION
FOR AMATEUR RADIO**

ARRL, the national association for Amateur Radio, formally known as the American Radio Relay League, Incorporated (ARRL), by counsel, hereby respectfully submits its comments in response to the *Public Notice* (the Notice), DA 17-1180, released December 7, 2017.¹ The *Notice* requests comment on the resiliency of the communications infrastructure, the effectiveness of emergency communications, and government and industry responses to the 2017 hurricane season. This season included four hurricanes which made landfall in the United States and its territories, which caused significant damage. The Commission notes that the purpose of the instant *Notice* is to understand the extent to which reliable communications services were provided during and after these hurricanes in order to assess what lessons may be learned for the future. The Public Safety and Homeland Security Bureau will ascertain areas for further discussion in one or more workshops to be held later, with respect to improving future hurricane response efforts. For its comments relative to the performance of the Amateur Radio Service in this recent series of hurricanes, ARRL states as follows:

¹ The Notice established a comment date of January 22, 2018. Therefore, these comments are timely filed.

I. Introduction.

1. The *Notice* asks a series of questions with respect to the damage to infrastructure; the Commission's regulatory response to these disasters; and the perspectives and experiences of communications users and communications providers. With respect to the value of Amateur Radio in the role of volunteer communications provider (and facilities restorer) in these hurricane relief efforts specifically, the Commission asks two questions: (1) To what extent were response efforts facilitated by Amateur Radio operators; and (2) Going forward, should efforts be made to increase the use of Amateur Radio services in connection with the planning, testing and provision of emergency response and recovery communications? ARRL is pleased to address these questions and others in the *Notice* applicable to Amateur Radio's performance, with reference to its extensive recent experience in assisting Puerto Rico and the U.S. Virgin Islands in the aftermath of Hurricane Maria; and more generally in virtually all natural disaster relief efforts in the United States and its territories for more than a century.

II. Background.

2. Since its inception and at the commencement of Federal licensing in the early 1910s, the Amateur Radio Service has always been far more than a "hobby" - a means for those curious in electronics and radio to expand their knowledge. The varied purposes and goals for the Service summarized by the Commission's rules (47 C.F.R. §97.1) establishing the Amateur Service illustrate its versatility:

The rules and regulations in this part are designed to provide an amateur radio service having a fundamental purpose as expressed in the following principles:

(a) Recognition and enhancement of the value of the amateur service to the public as a voluntary noncommercial communication service, particularly with respect to providing emergency communications.

(b) Continuation and extension of the amateur's proven ability to contribute to the advancement of the radio art.

(c) Encouragement and improvement of the amateur service through rules which provide for advancing skills in both the communication and technical phases of the art.

(d) Expansion of the existing reservoir within the amateur radio service of trained operators, technicians, and electronics experts.

(e) Continuation and extension of the amateur's unique ability to enhance international goodwill.

3. Each of those five principles is interrelated, having in common as a foundation the radio Amateur's ability to communicate effectively and efficiently in a variety of circumstances. Of these fundamental purposes, volunteer emergency communications are most obvious to the public. Emergency communications efforts of radio Amateurs are enhanced and facilitated by their ability to refine, adapt and improve equipment. They experiment with new and varied communications technologies and systems in order to better understand and utilize the propagation of radio waves. By virtue of this technical self-training and the educational programs available to the Amateur Radio community, the Service can effectively provide supplemental and restorative communications for emergency and disaster relief agencies and organizations.

4. A non-commercial, public service avocation, Amateur Radio emergency communications are provided on a voluntary basis. They are nonetheless reliable because their infrastructure is largely decentralized and not dependent on commercial power mains or fixed facilities that can fail. This resiliency is based on the multitude of individual stations deployed ubiquitously throughout towns, counties, and States. These volunteers offer their stations and their skills for emergency and disaster relief communications at no cost to States, municipalities, disaster relief agencies, and agencies of the Federal Government. Radio amateurs respond immediately, upon a call from served agencies following any type of emergency or disaster, with

working communications facilities and systems, manned by volunteer, trained communicators. They assist in restoring public safety communications facilities that have failed because they possess the technical knowledge and innovative creativity to do so. The wide geographic distribution of residential Amateur Radio stations ensures that there will always be located, within and outside the affected disaster area, functional Amateur Radio stations ready to relay information into and out from the location of the disaster.

5. Amateur Radio operators provide communications for the benefit of first responders until public safety facilities are restored to operation. They conduct temporary dispatch operations and substitute 911 services, cellular and conventional and trunked land mobile systems. Amateurs provide interoperability and mutual aid communications between and among public safety and other entities (interoperability that typically does not, even now, exist generally on an interagency basis). They provide efficient communications for disaster relief agencies, such as the American Red Cross and the Salvation Army, for the duration of disaster recovery efforts. Amateurs are known for their immediate responses to hurricanes, tornadoes, earthquakes, snow and ice storms, floods, fires and other natural disasters. They are available during and in the aftermath of such events, and they are prepared to deploy and commence communications without any advance requests.

6. This preparation for emergency communications deployment is enabled by the technical self-training that is inherent in the Service and facilitated by the licensing process. Many, perhaps most, telecommunications professionals derived their interest, and most of their basic technical and communications skills, from their avocational activities in Amateur Radio. Many developments in modern telecommunications, including low-Earth-orbit microsatellite technology, and many refinements and adaptations of new technologies, were and are the direct

result of Amateur Radio experimentation and inventiveness. That innovative spirit still exists today, despite the complexity of modern digital communications. Amateur broadband systems and other high-data-rate multimedia systems are in full deployment now. Software-defined radio systems are now widely available and are used daily in the Amateur high-frequency (HF) and VHF and UHF bands. The potential for improvement in Amateur Radio emergency communications and interoperability communications for served agencies as a result of the adaptation and regular use of SDR and broadband technology is limitless.

7. Worldwide, nationwide, statewide and local communications networks of Amateur Radio stations are in operation twenty-four hours per day, every day of every year, using Amateur Radio stations located in licensees' homes and via mobile stations. Since the Amateur Service is not dependent on fixed infrastructure and is ubiquitous, the ability of radio Amateurs to provide reliable communications instantly over any path cannot be defeated by any disaster, act of terrorism, or by any other means whatsoever. The volunteer services provided by radio amateurs cannot be duplicated by governmental entities at the Federal, state or local level at any cost. However, these services are provided at no cost. The Commission has at times described the Amateur Service as a "priceless public benefit." It has also specifically found that the Amateur Radio Service is "a service that is a model of public responsiveness in times of emergency and distress and a service that is a model of self-enforcement and volunteerism."²

8. Congress has repeatedly expressed similar sentiments. In Public Law 103-408 in 1994, Congress declared that Amateurs are to be "commended for their contributions to technical progress in electronics, and for their emergency radio communications in times of disaster;" that the Commission is "urged to continue and enhance the development of the Amateur Radio

² Report and Order, Docket 83-28, released December 23, 1983.

Service as a public benefit by enacting rules and regulations which encourage the use of new technologies” in the Amateur Service; and to make “reasonable accommodation for the effective operation of Amateur Radio from residences, private vehicles and public areas;” and that regulation at all levels of government should “facilitate and encourage amateur radio operation as a public benefit.” Earlier, in 1988, in Public Law 100-594, a sense of Congress resolution, at Section 10 thereof, Congress held that it “strongly encourages and supports the Amateur Radio Service and its emergency communications efforts;” and that “Government agencies shall take into account the valuable contributions made by Amateur Radio operators when considering actions affecting the Amateur Radio Service.” In the Communications Amendments Act of 1982, Public Law 97- 259, Congress, in praising the accomplishments of the Amateur Service, held that: “the Amateur Radio Service is as old as radio itself. Every single one of the early radio pioneers, experimenters, and inventors was an amateur; commercial, military and government radio was unknown. The zeal and dedication to the service of mankind of those early pioneers has provided the spiritual foundation for amateur radio over the years. The contributions of amateur radio operators to our present day communication techniques, facilities, and emergency communications have been invaluable.”

9. The service of the more than 750,000 licensed US Amateurs continues to the present time. In the post-Hurricane Katrina report undertaken by the Department of Homeland Security and issued by the White House, Amateur Radio was cited by the investigating commission as one of the things that “went right” during what became one of the greatest natural disasters in United States history.³ Lives were saved because of Amateurs being able to relay information out

³ See United States, Executive Office of the President. The Federal Response To Hurricane Katrina – Lessons Learned” Washington: GPO, 2006 at Appendix B page 135.

of the impacted area and routing it to the appropriate emergency response service.⁴ This dedication to service is exemplified almost daily across the country. In May, 2011 at an FCC forum on earthquake communications preparedness, former Federal Emergency Management Agency (FEMA) Administrator Craig Fugate described the Amateur Radio operator as “the ultimate backup, the originators of what we call social media.” Referencing Amateur Radio, Fugate said “During the initial communications out of Haiti (following the January 12, 2010 earthquake there), volunteers using assigned frequencies that they are allocated, their own equipment, their own money-- nobody pays them-- were the first ones oftentimes getting word out in the critical first hours and first days as the rest of the systems came back up. I think that there is a tendency because we have done so much to build infrastructure and resiliency in all our other systems, we have tended to dismiss that role: ‘When Everything Else Fails.’ Amateur Radio oftentimes is our last line of defense.” Mr. Fugate continued: “we get so sophisticated and we have gotten so used to the reliability and resilience in our wireless and wired and our broadcast industry and all of our public safety communications that we can never fathom that they’ll fail. They do. They have. They will. I think a strong Amateur Radio community [needs to be] plugged into these plans... when you need Amateur Radio, you really need them.”

10. There is no single model for effective communications during disasters and emergencies. Emergencies range from a localized situation affecting one community, or an insular area such as Puerto Rico or the Virgin Islands, to regional events affecting multiple

⁴ In the aftermath of Hurricane Katrina, Amateurs provided communications of all types: riding with first responders in helicopters, via VHF/UHF bands, communications were provided to first responders on the ground to facilitate rescue operations; High Frequency (HF) communications relayed information out of the affected areas and back to the appropriate emergency response groups. Interoperability communications were provided by Amateurs between and among groups of first responders. In addition to the large number of radio Amateurs in and near New Orleans, Louisiana whose home stations were used extensively, there were at one point more than 1,000 Amateur Radio volunteers in the greater New Orleans area providing communications for the benefit of those who were endangered or harmed by the flooding. This level of organization and preparedness is the direct result of regular drills, exercises and emergency simulations conducted from home stations as well as mobile facilities.

counties or larger areas. Wide area disasters may affect multiple states or entire regions of the country (such as a hurricane which, in its course, can impact states from Florida up the entire Eastern portion of the United States to Maine, as occurred in Hurricane Sandy and/or the entire Gulf coast and southern United States into Texas as occurred with Hurricanes Katrina and Rita). Disasters and emergencies do not respect county or state lines or the limits of jurisdiction of a State or municipal public safety agency. Differences in communications needs of a multiplicity of emergency management and disaster response officials dictate varied approaches to disaster planning and the configuration of Amateur Radio facilities to be used. Because of the differences in propagation at various times of the day and the distances and paths that emergency communications may need to cover, the ability for Amateurs to utilize any and all of their authorized frequency allocations [from medium-frequency (MF) through ultra-high frequency (UHF) and above] efficiently is necessary in order for the Service to be fully effective in disasters and emergency relief.

11. The frequency agility, resiliency, ubiquity and flexibility of the Amateur Radio Service and the communications skills of its licensees are principal reasons why it is considered a valuable resource by emergency officials. Regardless of atmospheric conditions, radio wave propagation, availability of commercial power, or the need for varied emissions types, the Amateur Service has a frequency allocation that will allow communications to be conducted into, within and out of an affected area and the ability to provide voice and data interoperability for disaster relief agencies and public safety services, most especially medical facilities. Amateur Radio emergency preparedness exercises emphasize the operation of residential fixed, portable and mobile stations without reliance on commercial power mains for extended periods of time. Amateur volunteers can continue operation regardless of the status of commercial

telecommunications facilities, wireline facilities, commercial antenna support structures, or maintaining an active connection to the Internet. With efficient, though often very simple antennas and a power source (such as a small portable generator, batteries, or alternate power sources such as a small solar array), the Amateur Radio Service is capable of providing its own portable infrastructure. If the basic communications infrastructure in a disaster area is available, Amateur Radio can leverage it. If the infrastructure is not in place, the Amateur Service can still provide support communication without any dependency on it.

12. The use by radio Amateurs of the radio spectrum in small segments of the medium, high, very high, and ultra high frequency bands and on microwave frequencies serves two fundamental purposes. First, it ensures that radio Amateurs have spectrum to use at all times of the day and night to provide long distance and short distance communications, voice, data or video, as needed with relatively flexible bandwidth emissions. A radio amateur in the continental United States can communicate with his or her counterpart in Puerto Rico, the Virgin Islands, Alaska, Hawaii, American Samoa or Guam before, during and after hurricanes or typhoons to coordinate relief efforts and delivery of medical supplies when other facilities are inoperable or overloaded. They may work with international relief organizations providing time-sensitive, lifesaving communications into disaster stricken areas such as Haiti after its earthquake or following the Japanese tsunami. He or she might provide video transmissions from helicopters in support of, and to coordinate, fire crews fighting the Colorado forest fires or overlooking flood areas. Short- distance voice transmissions among Amateurs allowed interoperability services by relaying of messages, for example, between NASA personnel and FBI agents in efforts to locate Space Shuttle Columbia wreckage in Texas. Amateur Radio continues to be a critical communications medium, contributing to the response to tornadoes in Alabama, Missouri or

Oklahoma; wildfires in New Mexico or California; hurricanes on the Eastern seaboard and the Gulf Coast; snow emergencies in New England; flooding along the Mississippi River basin; and more recently and most notably, in Puerto Rico and the Virgin Islands. Any transmission mode, any path distance and azimuth is possible via Amateur Radio. Frequency bands allocated to the Amateur Radio Service throughout the radio spectrum are used by groups of radio amateurs for different emergency communications applications. High speed, relatively wide bandwidth data communications and television transmissions are conducted in the microwave bands (as are very narrow bandwidth voice transmissions to study propagation and to improve receiver and preamplifier technology).

13. Radio Amateurs, especially since the events of September 11, 2001, have sought ever-greater volunteer roles in disaster relief, homeland security, and emergency communications. The Amateur Service has since then been afforded a Board seat with the National Public Safety Telecommunications Council (NPSTC) which provides opportunities for closer integration of Amateur Radio and public safety in emergency communications planning. ARRL has an affiliation with Citizen's Corps, a program for neighborhood alerting and security organized by the Department of Homeland Security. ARRL has long had memoranda of understanding with the Federal Emergency Management Agency (FEMA); with the National Weather Service; with the National Communications System of the Department of Defense; and with other entities such as the American Red Cross and the Salvation Army SATERN disaster response teams. Amateur Radio is included in virtually all state emergency communications plans. Through ARRL's Amateur Radio Emergency Service® program (ARES ®), hundreds of memoranda of cooperation are in place with state and local emergency management agencies, local disaster relief agencies, hospitals and other groups involved with disaster relief and

emergency response delineating the role of Amateur Radio operators in emergencies in local areas and for specific purposes. ARRL's work with the National Communications System (NCS) of the Department of Defense in its SHARES program, combines existing high frequency assets from 99 Federal, state, and industry organizations into a single emergency voice and data message handling network, supporting national security and emergency preparedness (NS/EP) when normal communications are destroyed or unavailable.

14. While the exact nature of an event constituting a communications emergency that would necessitate the use of Amateur Radio cannot be predicted, the two most common categories of events are natural disasters and weather-related emergencies. Hurricanes, tornadoes and winter storms are among the most common of these events. Because of this, the Amateur Radio Service interfaces with the National Weather Service (NWS) and the National Hurricane Center (NHC). The SKYWARN program of the NWS provides thousands of volunteers nationwide to serve as the "eyes" of the NWS using Amateur Radio stations at their residences when severe weather is imminent. These spotters also provide critical meteorological data that cannot be observed at the altitudes below NWS radar systems.⁵ While there are some trained SKYWARN spotters who participate from their personal vehicles as mobile units positioned at certain strategic locations, the majority of SKYWARN participants provide their detailed observations from their home station locations. Effective and reliable antennas are needed in order for these home stations to provide these detailed observations. The timeliness of SKYWARN reports submitted via Amateur Radio confirms what NWS sees on weather radars; it substantially increases the precision of severe weather forecasting; and it allows NWS to increase the warning and preparation times for those citizens in harm's way. The program works

⁵ NWS radar systems are inherently incapable of providing ground-level meteorological data provided by radio Amateurs.

very well: according to statistics from the NWS, approximately 290,000 trained SKYWARN spotters – *the majority being licensed Amateur Radio operators* – assist the NWS in providing accurate, reliable and immediate information on approximately 10,000 severe thunderstorms, 5,000 floods and 1,000 tornadoes on average each year.

15. The National Hurricane Center, on the campus of Florida International University in Miami, is the second major National Weather Service program supported by Amateur Radio. For the past 32 years, volunteer operators at the NHC's dedicated Amateur Radio station (callsign WX4NHC) are active during any hurricane activation. Because reports arrive from the Atlantic and Pacific basins, HF communication serves as a core component of this valuable NWS tool. The utility of HF communications in this life-saving effort reflects the need of Amateur stations in the field to provide their information to the NHC via effective, reliable HF stations at residences of licensees.

16. ARRL conducts emergency communications certification courses that provide the educational background and initial training necessary for such serious work. Thousands of local and state ARES groups regularly drill with local and state authorities and agencies in order to maintain their skills and improve the quality of their service. Emergency preparedness and training necessitates active, on-air communications experience and coordinated drills and exercises. This cannot be done unless an Amateur Radio licensee is able to conduct reasonably effective communications regularly from his or her residence.

III. Hurricane Harvey and the Amateur Radio Response

17. There were substantial differences in the impact of the four hurricanes on telecommunications infrastructure in the United States and its territories. In Houston, for

example, following Hurricane Harvey there was widespread flooding, but Amateur Radio operators in the area were *not* called upon to provide extensive restorative communications for first responders; it was not a communications emergency *per se*. Instead, the principal work of radio Amateurs was to provide communications for disaster relief agencies such as the American National Red Cross and the Salvation Army, and to conduct typical health-and-welfare traffic, weather spotting, and backup readiness planning. That is not to minimize the extensive, diligent work of radio Amateurs in the area; they simply assumed different roles than they would have in a different type of hurricane response. For example, Amateurs rotated shifts staffing the Harris County Emergency Operations Center (EOC) and operating the hurricane net control station there. There is an extensive network of repeaters in south Texas, makes it possible for local radio amateurs within the disaster area, serving as “eyes and ears,” spotting and reporting problems that require official attention, dispatched from the EOC. During the hurricane relief effort, emergency power supporting the county’s 800-MHz trunked radio system was in danger of being flooded out. Radio amateurs were involved in planning for contingency communications via Amateur Radio should there have occurred outages of the trunked public safety facility.

18. Amateur Radio Emergency Service volunteers provided support communication at some Red Cross shelters in South Texas for displaced families in the aftermath of catastrophic flooding. At least 3 dozen volunteers were assisting at those shelters. Another dozen were available to serve as Office of Emergency Management liaisons. The ARRL Emergency Preparedness Manager worked with the Red Cross to provide radio Amateur volunteers to serve as Red Cross-trained shelter managers and volunteer management specialists. A variety of emergency, health-and-welfare, traffic, and tactical nets in South Texas were active on HF bands throughout the weeks after the hurricane, and a wide array of VHF and UHF repeaters were

available and used as needed. The Salvation Team Emergency Radio Network (SATERN) was operated at HF and the Military Auxiliary Radio Service (MARS) used one of the 5.3 MHz interoperability channels available for this specific purpose. As Hurricane Harvey proceeded northeast toward Louisiana, ARES volunteers were activated, informed by amateur Weather Spotting networks and the NWS SKYWARN program. Despite this extensive outpouring of volunteer support, Hurricane Harvey resulted in relatively minimal impact on the region's communications infrastructure, considering the strength of the storm and the magnitude of the flooding. There were no unusual requests made to the Commission for any regulatory accommodations to ARRL's knowledge, nor did any appear necessary. According to ARRL's South Texas Public Information Officer, the "hardening" of the telecommunications infrastructure in south Texas to make it more immune to storm damage somewhat diminished the need for Amateur Radio communication support. He noted, however, that the Amateur Radio telecommunications infrastructure for emergency purposes in South Texas includes analog facilities, as "the lowest common denominator" of technology -- VHF/UHF FM, and HF -- because it provides the highest capacity for interoperability.

19. The Hurricane Watch Net (HWN) conducted HF operations for Hurricane Harvey, providing 51.5 continuous hours of activation. The VoIP Hurricane Net, and WX4NHC, the Amateur Radio station at the NHC in Miami, also activated as Harvey approached landfall in Texas as a Category 4 hurricane. In terms of internet-linked Amateur Radio stations in Houston, EchoLink 7203, IRLP 9219, and AllStar *33007203 were deployed to handle requests from the affected area at the request of Humanity Road.

IV. Hurricane Maria and the Amateur Radio Response.

20. Hurricane Harvey brought widespread flooding to the Houston area, but it did not result in the high wind damage that typically leads to the type of communications emergency more recently experienced in Puerto Rico and the Virgin Islands following Hurricane Maria. Typically, there are dual roles filled by Amateur Radio operators in these events. In the early stages of a communications emergency, radio Amateurs provide communications for first responders and medical facilities. After public safety facilities are restored, Amateur Radio is used to facilitate the work of disaster relief agencies and to provide health and welfare messaging. In Houston, the restorative communications function was largely unnecessary, because there were few public safety communications disruptions, although there is value in planning for the same, which was an ongoing effort in south Texas. In Puerto Rico and the Virgin Islands, it was a completely different story.

21. Because of the utter devastation that occurred in Puerto Rico, the approximately 500 local Amateur Radio operators who are actively and regularly available there for emergency communications purposes⁶ were not all available to provide restorative and other emergency communications because the operators themselves were concerned at the outset with basic survival of themselves and their families. ARRL estimates that there were approximately 75 Amateur Radio stations throughout the Island providing communications during the entire process -- from before the Hurricane hit until very late in the recovery effort. However, it was obvious that additional resources were going to be needed. And Amateur Radio volunteers responded immediately, without hesitation. Fifty of the nation's most accomplished Amateur Radio operators responded within 24 hours to the call of the American Red Cross, relayed by ARRL, to deploy to Puerto Rico and provide emergency communications. At the behest of Red

⁶ There are 4,238 licensed radio Amateurs in Puerto Rico and more than 200 licensees in the U.S. Virgin Islands.

Cross, ARRL called upon the United States' Amateur Radio community to provide up to 25 two-person teams of highly qualified hams. The group's principal mission was to move health-and-welfare information from the island back to the US mainland, where that data was used by the Red Cross. The group remained on the island for 3 weeks.

22. ARRL equipped each two-person team with a modern digital HF transceiver, special software, a wire antenna, a power supply and all the connecting cables, fitted in a rugged waterproof container such as is shown below. In addition, ARRL sent a number of small, 2,000-Watt portable generators as well as solar-powered battery chargers of the variety the US military uses on extended deployments. ARRL's Ham Aid program adapted and provided nearly \$75,000 in Amateur Radio equipment to the volunteers that deployed to Puerto Rico and to the ARRL Puerto Rico Section staff. Some of this equipment is still being used in Puerto Rico for the recovery effort.



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The Amateurs and their equipment were sent to Red Cross shelters extending from San Juan to the western end of the island. Donations from the Amateur Radio community in support of this effort totaled more than \$75,000. This was the first time in the nearly 75-year relationship between ARRL and the American Red Cross that such a request for assistance had been made. Because Hurricane Maria devastated the island's communications infrastructure, without electricity and telephone service, and with most of the cell sites inoperative, millions of Americans were cut off from communicating. Shelters were unable to reach local emergency services. Nor could people check on the welfare of their loved ones. The situation was dire and the Amateur Radio response was timely in order to address the crisis. Referred to as the "Force of 50," the Amateur Radio volunteers were deployed as Red Cross volunteers, but they provided communications for local law enforcement and utility managers; island-to-mainland health-and-welfare traffic, and outgoing communications from the more remote areas of Puerto Rico in the mountains to San Juan and other municipios. Fire officials in Puerto Rico facilitated safe passage, food, shelter, and water for the volunteers at fire stations on the island, as needed. The volunteers initially gathered at the convention center in San Juan, which served as the Puerto Rico Emergency Management Agency (PREMA) headquarters. The Force of 50 and local radio Amateurs, led by ARRL Section Manager Oscar Resto, KP4RF, staffed VHF and HF nets at the American Red Cross temporary headquarters, despite severe damage to their own homes. The nets covered nearly two-thirds of the island. In addition to the health and welfare traffic and Red Cross information transfer, the volunteers handled traffic to and from the power company, Autoridad de Energía Eléctrica (AEE), and state and local authorities relative to power restoration efforts. Twelve team members were assigned to provide communication for engineers tasked with repair to the island's power distribution centers.

23. The Red Cross Headquarters net, staffed by radio Amateurs, provided 24-hour operation in preparation for an anticipated emergency involving the Guajataca hydroelectric dam. Amateurs provided notices to residents in the districts of Quebradillas, Isabela, and San Sebastián of the danger. An Amateur volunteer was stationed in Quebradillas to provide emergency communication if needed and to maintain contact between AEE and its Monacillo control center. An Amateur Radio station was installed and an operator embedded at the Puerto Rico Emergency Operations Center (PREOC). Local radio Amateurs established VHF communication capabilities at 51 hospitals throughout the island, so they could have direct contact with the PREOC. The Amateur embedded at the PREOC served as liaison between the PREOC and the FEMA Emergency Support Function (ESF-2) task force, relaying information among the Red Cross, ARRL, FEMA, and the ESF-2 task force.

24. Two team members deployed in the westernmost end of the Island. “Team Oeste (Mayagüez)” were stationed at a Red Cross shelter in Mayagüez, providing the only emergency communication link from that city to San Juan initially. That team relayed needs and conditions of those living in and around Mayagüez and coordinated water delivery and other urgent necessities, such as non-perishable food items, extended-life dry milk, blankets, baby formula, and dust masks. They provided communications for the medical staff set up at the Palacio de Recreacion y Deportes, a sports facility in Mayagüez converted to a medical facility. Lists of medical needs were relayed to the Red Cross as well as to FEMA and Puerto Rico’s Emergency Management Agency. An HF station with *WinLink* (HF data) capability and a VHF/UHF station were set up in the FEMA disaster field office, and volunteers reported in by radio from around the island to post situation reports. Amateur operators were also posted at four power-generation facilities, at the request of the power company. Superacueducto, the water utility, asked for

several Amateur Radio Operators to help in re-establishing water flow from Arecibo to San Juan. Four Amateur Radio volunteers were positioned to accompany and provide VHF communication at Red Cross distribution centers on a daily basis. Two volunteers also were sent to Culebra Island to establish VHF and HF communication there. Those volunteers provided the first communications from Culebra following the storm.

25. Critical to the value of the Amateur Radio response to Hurricane Maria were the partnerships that had been established long before the event. As discussed above, ARRL has national partnerships with, *inter alia*, the American Red Cross, the Federal Emergency Management Agency, and The Salvation Army. ARRL worked closely with the Red Cross in Puerto Rico and, due to the work of local volunteers in the ARRL field organization in Puerto Rico, a network of relationships across the island has been in place for many years. Amateur Radio emergency and disaster preparedness through building partnerships allows our volunteers to be integrated into response in an effective way on exceptionally short notice. The radio Amateurs in Puerto Rico are extremely well-organized, and, given the severity of the damage and personal deprivations suffered by everyone, including the vast majority of local Amateur Radio licensees, they responded in large, and sufficient, numbers. They are deserving of a great deal of credit for their performance in the face of tremendous personal loss and sacrifice.

26. In addition to non-Amateur Radio partners and the local Amateur Radio communities in both Puerto Rico and the Virgin Islands, there are also relationships that have been built between different Amateur Radio groups that focus on emergency and disaster communications. ARRL worked with parts such as US Army MARS, WX4NHC Amateur Radio at the National Hurricane Center, and the Salvation Army Team Emergency Radio Network (SATERN) so the

broader Amateur Radio response was coordinated and made effective use of each group's strengths and assets.

27. There were several other lessons learned from this extensive test of Amateur Radio's emergency capabilities. Throughout Puerto Rico, normal communications were disrupted isolating communities and hampering emergency response. Amateur Radio operators extensively utilized conventional, analog VHF systems and HF radio email systems to successfully pass lifesaving messages between government and non-government entities. Through our volunteers deployed from the mainland to Puerto Rico and the resident ARRL Puerto Rico Section, radio Amateurs effectively integrated into the Joint Field Office (JFO) in ESF-2 (Communications). This allowed for an effective flow of information between Amateur Radio volunteers throughout the island and Federal responders responsible for communications restoration. Amateur Radio operators supported many NGOs responding to Puerto Rico as well. Amateur Radio volunteers supporting Team Rubicon and Southern Baptist Disaster Relief worked alongside radio amateurs supporting Red Cross and JFO ESF-2. The Department of Homeland Security SHARES program also played a key role in providing Amateur Radio support to JFO ESF-2 when the volunteers there were at the end of their tour.

28. Radio amateurs provided support to military responders when clear channel HF communications were needed for military missions.⁷ The expertise radio amateurs have with HF communications is tremendously valuable when frequency selection, interference and propagation hinder response and where, as in Hurricane Maria, there is a large volume of message traffic between the U.S. Mainland and geographically separated Caribbean islands. In

⁷ Among other things, Amateur Radio operators provided HF communications for the military when helicopters were out of line-of-sight range and needed to communicate with base stations obscured by the extremely mountainous terrain in Puerto Rico.

this case perhaps the most urgent lesson learned is that *the value of an active and engaged group of local Amateur Radio operators with pre-existing effective outdoor antennas cannot be overstated. Local radio amateurs understand their communities, the threats faced, and the response culture better than do volunteers from the outside.* The “Force of 50” would not have been successful but for the exceptional spirit of volunteerism by Puerto Rico radio Amateurs and their relatively unfettered ability to erect effective outdoor antennas, and the fact that those local Amateur stations were in place and ready to provide communications long before the 2017 hurricane season. It was local radio Amateurs, using stations at their residences and portable stations who initiated restorative communications operations before the Force of 50 arrived, and they continued those efforts many weeks after the Hurricane. It was also notable that Amateur Radio repeaters that were damaged by hurricanes Irma and Maria were quickly put back on the air to assist with response communications. Radio amateurs, along with great flexibility in response, possess expertise and equipment that can reestablish their networks when damaged and get them back on the air quickly.

29. In other respects, the Amateur Radio deployment followed standard operating procedures and that pre-planning worked exceptionally well. Any time a hurricane, particularly a major one such as Harvey, Irma or Maria is developing, ARRL takes specific actions. First, it reaches out to its Field Organization for information. They provide communications support during a storm response. It also works with national partners: the National Hurricane Center (NHC), the Red Cross, The Salvation Army, FEMA, SHARES, and National Voluntary Organizations Active in Disaster (VOAD) members, to help match potential needs they have with Amateur Radio resources in the field. ARRL also coordinates closely with available

Amateur Radio resources, such as SATERN, the Hurricane Watch Net (HWN), the VoIP Hurricane Net, and WX4NHC, the Amateur Radio station at the NHC in Miami.

V. The Commission's Hurricane Response and Urgent Regulatory Needs of the Amateur Radio Service

30. Given the foregoing, ARRL can respond to the Commission's two specific questions asked in this proceeding quite easily. First, Hurricane response and recovery efforts are facilitated by Amateur Radio operators to the extent that a given disaster is a communications emergency. Amateur Radio provides a measured, contextual, "as needed" response to each emergency. Amateur Radio involvement can be relatively nominal in a local emergency, or in a larger, non-communications emergency, or it can be very extensive, as was the case in the Virgin Islands and Puerto Rico following Hurricane Maria. As former FEMA Administrator Craig Fugate noted, you don't always need Amateur Radio operators, "but when you need them, you really need them."

31. As to the second question asked in the *Notice*, whether efforts should be made to increase the use of Amateur Radio services in connection with the planning, testing and provision of emergency response and recovery communications, ARRL would suggest that it is apparent from the foregoing that Amateur Radio is *already* included to a very large degree in emergency response and recovery planning at Federal, State and local levels, and with numerous served agencies, including several major NGOs. FEMA has in the past instructed local governments to make use of Amateur Radio in their disaster planning. Most do. That said, ARRL remains ready, willing and able to discuss with the Commission's Public Safety and Homeland Security Bureau opportunities for expansion of this effort, and increased incorporation of Amateur Radio in emergency alerting, restorative communications and facilities restoration efforts, and in the provision of health and welfare communications where needed. In a service of

750,000 licensees, there is clearly expanded capacity for emergency communications involvement, and ARRL data show that a principal interest of young people who become involved in Amateur Radio is in public service and emergency communications initiatives.

32. There are relatively few regulatory needs that the Amateur Service has in order to even better fulfill its 47 C.F.R. §97.1(a) obligation to provide emergency and disaster relief communications. There are, however, three very noteworthy and urgent needs that do call for some regulatory involvement of the Commission, right now. The first relates to an outdated regulation that limits data rates in HF Amateur communications, precluding certain digital emissions that have recently proven extremely important in Amateur Radio hurricane relief efforts. On November 14, 2013, ARRL filed a Petition for Rule Making, RM-11708, which proposed to modify the Commission's Amateur Radio Service rules to eliminate the symbol rate limit in those rules relative to data emissions in the Amateur allocations below 29.7 MHz; and to establish a 2.8 kilohertz maximum occupied bandwidth for data emissions in those bands. This deregulatory action was necessary in order to allow the use of PACTOR 4, a data emission in the HF bands that has great utility. The Petition was placed on Public Notice by the Wireless Bureau on November 21, 2013. However, no further action was taken on the Petition until July 28, 2016 when the Commission released a *Notice of Proposed Rule Making* in WT Docket 16-239. The ARRL Petition asked two things: (1) to delete from the Part 97 rules the symbol rate limitation for data emissions in the band segments where RTTY and data emissions are now permitted; and (2) to establish a maximum occupied bandwidth of 2.8 kHz for data emissions in the medium-frequency (MF) and high-frequency (HF) bands where data emissions are permitted now. These actions would permit use of various high-data-rate digital emissions in the HF bands which are

very useful in disaster relief communications, and at the same time ensure that no one signal usurped more of the very limited bandwidth in the small, shared HF Amateur allocations.

33. The Notice of Proposed Rule Making in that proceeding proposed, however, only to “remove limitations on the symbol rate... applicable to data emissions in certain amateur bands.” That Notice said that the Commission “believe(s) that this rule change will allow amateur service licensees to use modern digital emissions, thereby better fulfilling the purposes of the amateur service and enhancing its usefulness.” However, no action has been taken to date, and the ARRL proposal is now well more than four years old.

34. Equipment dispatched with the “Force of 50” to Puerto Rico included data transmission equipment capable of PACTOR 4 operation, but it could not be legally used in the Hurricane Maria disaster relief effort. ARRL filed a request for a temporary waiver to permit amateur data transmissions at a higher symbol rate than currently is permitted by Section 97.307(f) of the Commission’s rules, in order to facilitate hurricane relief communications between the continental United States and Puerto Rico.⁸ The Mobility Division of the Wireless Bureau quickly granted⁹ this waiver which greatly facilitated the disaster relief communications in Puerto Rico provided by Amateur Radio operators. However, it should not have been necessary to wait more than four years for the underlying rulemaking proceeding to have been resolved and it should not have been necessary to ask for a temporary waiver of a hopelessly outdated rule that limits data speeds for no useful reason, in order for Amateur Radio operators to quickly deploy equipment that was absolutely necessary to perform the functions that were needed at the time. ARRL would urge the Wireless Bureau to please ensure that the rather simple

⁸ E-mail from Christopher D. Imlay, General Counsel, ARRL to Donald K. Stockdale, Jr., Roger Noel, and Scot Stone, FCC (Sept. 29, 2017 16:06 EDT) (Waiver Request).

⁹ See the Order, *American Radio Relay League, Emergency Request for a Temporary Waiver of Section 97.307(f) of the Commission’s Rules*, DA 17-974, Released October 4, 2017.

but long-delayed Docket 16-239 rulemaking proceeding is resolved before the commencement of the next hurricane season.

35. The second urgent regulatory need of the Amateur Service, in order to ensure the continuation of emergency communications readiness, is relative to the ubiquitous presence and exponential increase in unreasonable and unnecessary private land use regulations in the United States that preclude the ability of licensed radio amateurs to erect and maintain any effective outdoor antenna at all. This is without any doubt at all the largest threat to the Amateur Radio community's ability to respond to disasters, severe weather, and other threats to lives and property in the United States. Perhaps the most important element of the ability of local radio Amateurs throughout Puerto Rico to be immediately ready to provide the restorative communications that they did provide very effectively is that they had the ability, long before the Hurricane arrived, to install and maintain effective outdoor antennas for the HF and VHF and UHF bands at their residences. There is not yet in Puerto Rico the prevalence of preclusive private land use regulations¹⁰ that now exists in the rest of the United States, but the situation is dire in most other suburban, urban and exurban areas. It is important in analyzing this issue to view the Amateur Service as a decentralized network of individual stations working together in emergency situations and in preparing for the same. The essentially uniform distribution of Amateur Radio stations in residential areas makes those individual stations very important in a given weather disaster in the area where those stations are located when commercial communications systems are disabled or overloaded, or in other areas for purposes of relay of message traffic. Amateur stations are often called on to report severe weather and the geographic

¹⁰ This is changing, however. There is with virtually all new housing starts in the United States the accompanying obligation (imposed by lenders) on land developers to subject all residences in the subdivision to declarations of covenants and homeowners' association rules, which almost universally preclude outdoor antennas. This trend is just as true in Puerto Rico as in other parts of the country.

distribution of stations in residential areas is critical for this function as well, per the discussion above. Furthermore, while modern Amateur stations are portable, and transportable to remote disaster locations, it is critical to have stations located at one's residence in order to regularly participate in disaster preparedness training exercises and drills. It is impossible to look toward enhancements in the use of Amateur Radio communications when the ability to self-train and self-educate by means of an effective, reliable Amateur Radio station at one's residence is precluded by the inability to install a functional outdoor antenna. There is no substitute for the ready availability of a residential Amateur Radio station in daily operation from a licensee's residence. The licensee cannot be expected to have the ability to communicate into or from a disaster site unless he or she has a station with an effective outdoor antenna capable of operation on multiple frequency bands at once, which is ready to be pressed into service from the licensee's residence at a moment's notice. The major value of Amateur Radio emergency communications is during the first hours, days or weeks of a disaster when commercial and public safety communications facilities are not functional or are overloaded. Stations must be ready to operate when needed and emergency communications are most often conducted from a licensee's residence. For some disabled persons, home stations represent their only opportunity to participate in emergency communications. Private land use regulations which exclude Amateur Radio stations from entire communities preclude emergency communications readiness.

36. Given the prevalence and increasing numbers ¹¹ of private land use regulated communities in the United States, residential Amateur Radio antennas cannot be installed or maintained in most of them. An Amateur Radio licensee who must live in a deed restricted

¹¹ According to the Community Associations Institute, 90 percent of new housing starts in the United States are subject to private land use regulations. This is because, now, essentially all lenders for land developers in the United States require, as a condition for funding a new housing development, all require a declaration of covenants be filed with the subdivision plat.

community currently will almost inevitably be subject to either (1) a complete prohibition of his or her Amateur Radio operation, or (2) the unlimited jurisdiction of a community association or architectural control committee or board which makes decisions concerning Amateur Radio antennas without any standards or limits whatsoever. Those private land use regulations (or the application of them) which prohibit outdoor Amateur Radio antennas or transmissions, and thus preclude Amateur Radio entirely; those which fail to permit the installation of effective outdoor Amateur Radio antennas; and those which do not constitute the minimum practicable regulation to accomplish the (aesthetic) goals are unreasonable and unnecessary.

37. There is now pending in Congress the Amateur Radio Parity Act of 2017.¹² H.R. 555 passed the House unanimously in January of 2017. An identical predecessor House Bill, H.R. 1301 passed the House in the 114th Congress. The current Senate Bill, S. 1534 was introduced in July of 2017. This is a balanced, completely bipartisan bill that would protect both the entitlement of Amateur Radio volunteers to be able to utilize their FCC-issued licenses to provide emergency, disaster relief and public service communications, while at the same time protecting the aesthetic concerns and the jurisdiction of homeowners' associations. The Bill is unopposed: it has the support of both ARRL and the Community Associations Institute (CAI) which is the national association of homeowners' associations. ARRL and CAI have cooperatively and carefully negotiated the current language of the Bill, and both organizations have stated their support for the present, amended version which contains the following provisions. The Bill calls on the Commission to enact rules that prohibit the application to Amateur Radio stations of deed restrictions which preclude Amateur Radio communications. Also prohibited are those deed restrictions which do not permit an Amateur Radio operator living in a deed-restricted community to install and maintain an effective outdoor antenna on property

¹² See, H.R. 555 and S. 1534.

under the exclusive use or control of the licensee; and those restrictions which do not impose the minimum practicable restriction on Amateur communications to accomplish the lawful purposes of a Homeowner's Association (HOA) seeking to enforce the restriction. Amateurs who wish to install an antenna in a deed restricted community where there is an HOA may be required to notify and obtain prior approval of the HOA. HOAs can preclude Amateur antennas in common areas (property not under the exclusive use of the licensee). HOAs can enact reasonable written rules governing height, location, size and aesthetic impact of, and installation requirements for, outdoor antennas and support structures for amateur communications but the effective outdoor antenna requirement is paramount. The Bill is currently before the Senate Commerce Committee. If, however, Congress is unable, as has been rumored, to pass any telecommunications legislation this term, it will be incumbent on the Commission to take the action on its own initiative that would be called for by this legislation. The future of Amateur Radio emergency communications is dependent on it.

38. The final regulatory action urgently necessary to improve Amateur Radio emergency communications would be to take the action requested in ARRL's Petition for Rule Making, RM-11785, filed January 12, 2017. The Petition proposes to amend Section 2.106, the Table of Allocations, and several sections of the Part 97 Service Rules, so as to implement domestically that portion of the Final Acts of the 2015 World Radiocommunication Conference ("WRC-15")¹³ that provided for the international allocation of the band 5351.5 - 5366.5 kHz to the Amateur Radio Service on a secondary basis. A contiguous band in the vicinity of 5 MHz will assist in conducting emergency and disaster relief communications in the United States; with the Caribbean basin; with Alaska and with other parts of North, Central and South America. Since

¹³ WRC-15 Final Acts, (Geneva, 2015).

2003, pursuant to a *Report and Order* in ET Docket No. 02-98,¹⁴ United States radio Amateurs have utilized five, 2.8 kilohertz bandwidth channels within the band 5250-5450 kHz on a secondary basis [See, 47 C.F.R. §97.203(c)]. The power limit on those discrete channels is now 100 watts ERP pursuant to the *Report and Order*, FCC 11-171, released November 18, 2011.¹⁵ That Report and Order replaced one of the five channels (5368 kHz) with a less encumbered frequency (5358.5 kHz); increased the maximum authorized power amateur stations may transmit from 50 watts ERP to 100 watts ERP; and authorized amateur stations to transmit three additional emission designators (150HA1A, 60H0J2B, and 2K80J2D) so as to permit use of Morse telegraphy and different forms of narrowband data in addition to SSB telephony. The 100 watt limit is critical because the purpose of the 60-meter channels in the first place was to be able to facilitate a propagation gap between 80 and 40 meters (i.e. between 3.5 MHz and 7 MHz) for the purpose of providing disaster relief communications between the continental U.S. and the Caribbean basin. The band is in use during the hurricane seasons when static crashes and high noise levels prevail on those paths. The power level is critical to a successful domestic implementation of the contiguous allocation. The power level authorized internationally at WRC-15, however, is far, far lower, insufficient for the disaster relief communications provided in the frequency range. While the contiguous band allocated in all three ITU regions for Amateur use is but 15 kilohertz wide, it will, if implemented functionally, and in addition to, rather than in lieu of the channels now in use; and if the Part 97 service rules for this contiguous band are thoughtfully enacted, *radically* improve the current, very limited capacity of the Amateur Service in the United States to address emergencies and disaster relief during times when the 5 MHz band carries a great deal of traffic between the U.S. mainland and the Caribbean basin. This is

¹⁴ FCC 03-105, 18 FCC Rcd. 10258 (2003)

¹⁵ *Amendment of Parts 2 and 97 of the Commission's Rules to Facilitate Use by the Amateur Radio Service of the Allocation at 5 MHz*, FCC 11-171, ET Docket 10-98, 26 FCC Rcd. 16551, 77 Fed. Reg. 5406 (2011).

most notably an issue in the Caribbean basin, but the same effect will be realized elsewhere as well, at all times of the day and night, and at all times of the sunspot cycle. As more countries adopt the WRC-15 result, including several Caribbean countries that rely on the low HF bands for communication among each other and with the United States during weather-related emergencies, the United States should be the leader in enhancing and encouraging this volunteer resource and the interoperability it provides. In fact, however, Canadian regulatory authorities are in regular communication with Radio Amateurs of Canada, ARRL's counterpart in Canada, about implementing the 5351.5 - 5366.5 kHz allocation. The Commission should move forward with this enabling authorization as well.

39. ARRL looks forward to further dialog with the Public Safety and Homeland Security Bureau about these three urgent regulatory topics and would welcome the chance to participate in a workshop to discuss improvements and extensions of the role of Amateur Radio volunteers in emergency and disaster relief communications.

Therefore, the foregoing considered, ARRL respectfully requests that the Commission

proceed with the actions recommended herein, to improve the capabilities and to facilitate the provision of emergency and disaster relief communications via Amateur Radio.

Respectfully submitted,

**ARRL, THE NATIONAL ASSOCIATION FOR
AMATEUR RADIO**

225 Main Street
Newington, CT 06111-1494

By: *Christopher D. Imlay*

Christopher D. Imlay
Its General Counsel

BOOTH, FRERET & IMLAY, LLC
14356 Cape May Road
Silver Spring, MD 20904-6011
(301) 384-5525
W3KD@arrl.org

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