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November 21, 2017

Federal Communications Commission
Ms. Marlene Dortch, Secretary
445 12th Street, S.W.
Washington, DC 20554

RE: Reply Comment to Letter in response to GN Docket No. 17-183 Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz Notice of Inquiry

Dear Ms. Dortch,

The American Meteorological Society (AMS), National Weather Association (NWA) and American Weather and Climate Industry Association (AWCIA) appreciate the opportunity to provide reply comments to the *Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz Notice of Inquiry* adopted by the Commission on 8 August 2017 (the "NOI"), specifically potential new terrestrial services in the 3.7-4.2 GHz band. In response to the comments of the Satellite Industry Association[1], and the reply comments of Aviation Spectrum Resources, Inc. (ASRI)[2], the Satellite Industry Association (SIA)[3] and the National Spectrum Management Association (NSMA)[4], our organizations wish to concur with these filers for noting the importance of unfettered access to the NOAAPort system, which provides important weather information to many meteorological users in the public, private and academic sectors for whom the nation relies on for critical weather forecasts, watches and warnings. This letter will highlight that the nation is at risk of diminishing quality weather forecasts if the NOAAPort system faces any risk of interference and will provide wider context from the meteorological community about the nature of this commercial satellite system that relies on the 3.7-4.2 GHz band.

Founded in 1919, the AMS is the nation's premier scientific and professional organization promoting and disseminating information about the atmospheric, oceanic, hydrologic sciences. Its more than 13,000 members include scientists, researchers, educators, broadcast meteorologists, students, weather enthusiasts, and other professionals in the fields of weather, water, and climate. The AMS represents academic, government, and industry members.

The NWA is a member-led, all-inclusive, professional association supporting and promoting excellence in operational meteorology and related activities since its founding in 1975. We currently

[1] See Comments of Satellite Industry Association, GN-17183 (Oct. 2, 2017) ("SIA Comments")
[2] See Reply Comments of Aviation Spectrum Resources, Inc., GN-17183 (Oct. 3, 2017) ("ASRI Reply Comments").
[3] See Reply Comments of Satellite Industry Association, GN-17183 (Nov. 15, 2017) ("SIA Reply Comments")
[4] See Reply Comments of National Spectrum Management Association, GN-17183 (Nov. 15, 2017) ("NSMA Reply Comments")

have 2200 individual and corporate members. The NWA mission is to connect operational meteorologists in pursuit of excellence in weather forecasting, communication and service.

AWCIA was organized in the 1980s as the Commercial Weather Services Association (CWSA) to support commercial weather service providers by focusing all commercial interests into one unified voice. AWCIA is the trade association for the professionals who make weather their business and represents a diverse weather industry and the industry's diverse needs. AWCIA is an organization run by its members, for its members, and we are committed to growing the industry by providing services to our members, ultimately making a stronger American Weather Enterprise.

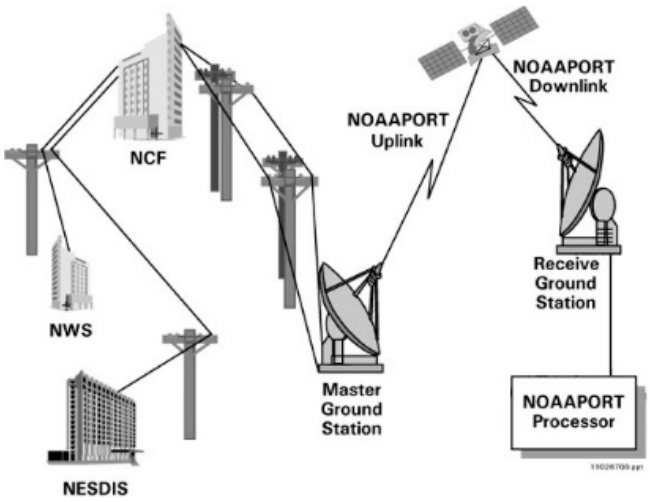
What is NOAAPort and who uses it?
Many federal users of weather and water data, including NOAA's National Weather Service (NWS), the Federal Aviation Administration (FAA), military branches such as the Navy and other federal agencies, receive their information via receiving systems in C-band (3.7 – 4.2 GHz). About 167 ground locations, within NOAA and the FAA, receive data via the Satellite Broadcast Network (also known as NOAAPort), as shown graphically in NSMA's reply comments.

Similarly, non-federal use of NOAAPort is widespread, with aviation users, academia and private sector meteorological users operating their own receive-only non-licensed NOAAPort systems. In addition, some media outlets, especially television stations, receive NOAAPort information directly as well to support their local forecasting capabilities, especially in times of severe weather.

Overall for both federal and non-federal users, NOAAPort serves as an important complement to land-based communications to ensure high availability of weather data transfer, crucial for success of the Weather Enterprise's shared public service mission. In addition, NOAA Weather Wire, a separate distribution service for text bulletins (including NWS warnings), previously provided by a vendor, was moved into the NWS several years ago and is included as a channel on NOAAPORT now. This is a very important way that the public and private sectors coordinate quickly and reliably about NWS issued warnings to enhance communications to citizens.

How does NOAAPort work?
Scientific workstations used by many federal users, such as weather forecasters and hydrologists, receive much of their source data from NOAA satellites, terrestrial sensors and radars via NOAAPort in 3.7 – 4.2 GHz spectrum. These workstations, called the Advanced Weather Interactive Processing System (AWIPS), support forecast meteorologists and hydrologists at 167 locations within and outside the continental U.S., including Alaska, Hawaii, Puerto Rico and Guam. These locations as well as the FAA's Air Route Traffic Control Regions are detailed in maps included with the NSMA reply comment on Nov 15, 2017.

Weather data is collected by environmental sensors on NOAA's geostationary and polar-orbiting weather satellites and NWS observing systems, and processed to create products. The products are



fed to the AWIPS Network Control Facility (NCF) which routes the products to the appropriate NOAAPort channel for uplink and broadcast. Forecasters use the data from the various channels carried via the 3.7 – 4.2 GHz commercial satellite relay as the basis for the generation of weather products necessary for the safety of life and property and in support of industry segments of weather-sensitive industries. A graphical representation of the structure of data inputs and outputs from NOAAPort is included here.

Meteorologists and hydrologists staff the various federal offices that rely on this information, especially in NWS and FAA, using the data received in 3.7 – 4.2 GHz, for major sources of weather data and weather model outputs. These federal entities conduct the forecasting operations associated with issuing watches and warnings related to hazards that the public relies upon, as well as the operational decision making on the rerouting of aircraft due to weather within the U.S. national air space.

How is the use of NOAAPort distinct and important in comparison to other spectrum-reliant technologies used by the meteorological and hydrological community?
The satellite data transmitted via NOAAPort into the AWIPS system consists of only some of the available imagery from NOAA's environmental satellites. The GOES satellite information entering AWIPS from NOAAPort has been processed into sectorized blocks for specific regions and focuses on those data types that are most important to the individual NWS Weather Forecast Offices (WFOs) and Regional Offices to complete their core work to generate watches and warnings. Some key products included are generated from cloud and moisture imagery, but other selected satellite products are included as well.

In contrast, when there is a need for a more comprehensive set of information coming from NOAA's Geostationary Operational Environmental Satellites (GOES), such breadth of information (including all spectral bands and regions of coverage from the system) is only available in real-time from GOES Re-Broadcast service (GRB) (which operates between 1675-1695 MHz). This service is extremely important for federal users who require complete data sets, and/or low data latency/high data availability, such as the work of the National Hurricane Center, the Storm Prediction Center, the Weather Prediction Center, the Space Weather Prediction Center and the Aviation Weather Center, all of which have their own GRB downlink stations. Also, in the most severe forecasting situations, when minutes and seconds matter, the data transmitted through the GRB system is available more quickly than the more processed information via NOAAPort.

Why is NOAAPort in C-Band? Why is it different from other weather spectrum needs?
NOAAPort's use of Mid-Band spectrum provides reliable communications during precipitation and severe weather events, which is when this information is of greatest need for public benefit. The coverage of C-band satellite beams on the surface of the Earth, provides for a wider coverage area than higher frequency commercial satellite bands. As noted in the SIA comments in this proceeding:

> *"C-band spectrum is resistant to rain fade and allows broad coverage areas, making C-band satellite service ideal for customers… that require highly reliable nationwide distribution networks."*

Such characteristics show C-Band is particularly well suited to weather and hydrologic users. Moving into a higher frequency area would result in more disruptions during weather events and small beams that would not cover the broad area necessary to reach all required federal users as well as other users.

NOAAPort is currently surrounded in the C-band by similar satellite communications services working at similar power levels. This NOI, however, proposes pairing disparate services in the same area of spectrum, which has the potential for much more devastating interference, especially for low power, yet critical services like those provided by NOAAPort. The weather community concurs with SIA's statement in its reply comment:

> *"Attempting to impose co-frequency, co-coverage sharing between satellite services and new terrestrial operations would clearly fail to achieve its intended effect. Preventing interference to thousands of receive earth stations that require the flexibility to operate with multiple satellites across the C-band spectrum would require substantial separation distances, leaving limited or no opportunity for terrestrial deployment in much of the country. Moreover, the fact that the overwhelming majority of earth stations are unregistered makes Commission forced implementation of such separation distances impractical."*

Balancing the need for spectrum with protecting technologies guarding public safety
The weather community understands the need for sharing and flexibility given the demand for spectrum for enhanced technology innovation for society. This has been demonstrated by how NOAA and the weather/water community have already moved and consolidated[5] its spectrum usage significantly in the past 5 years. But life and safety of citizens facing severe weather hazards and receiving critical information from NOAA and its private sector partners are crucial to our society, as learned through this year's incredibly active hurricane season.

[5] The FCC sold 1670 - 1675 MHz at auction 46 in May 2003, indicating that this 5 MHz was to be shared on a co-primary basis with the Federal Government (NOAA), http://wireless.fcc.gov/auctions/default.htm?job=auction_factsheet&id=46 and the FCC sold Block A1: 1695 - 1710 MHz at auction 97 (for about $2.4B) as part of the AWS-3 sale. http://wireless.fcc.gov/auctions/default.htm?job=auction_factsheet&id=97. This means that NOAA has already shared 50% of the spectrum (e.g., 20 MHz out of the 40 MHz) they were/are authorized to use in the 1670-1710 MHz band. The GOES related services provided in this area (and mentioned on page 2 and 3 of this reply comment) are complementary to the NOAAPort services, which are the subject of this comment.

We understand the FCC believes this NOI will lead to the advancement of technology, but it is important our concerns are heeded and recognize there is need for pause before advancing with rulemaking in the Mid-band spectrum to ensure public safety needs in response to natural hazards are considered. Thank you for the opportunity to represent our membership and comment on this issue of importance to our organizations and society.

Sincerely,





Dr. Keith Seitter	Janice Bunting	Steven A. Root, CCM
AMS Executive Director	NWA Executive Director	President, AWCIA

Cc:
RDML Tim Gallaudet, Ph.D., USN Ret., Assistant Secretary of Commerce for Oceans and Atmosphere and Acting Under Secretary of Commerce for Oceans and Atmosphere
Dr. Stephen Volz, Acting Assistant Secretary for Environmental Observation & Prediction and Assistant Administrator for Satellite and Information Services
Dr. Louis W. Uccellini, Assistant Administrator for Weather Services, and Director of the National Weather Service