Before the
UNITED STATES DEPARTMENT OF AGRICULTURE
Washington, DC 20250

In the Matter of	)	
	)	
Innovative Technologies and Practices for the Agriculture Innovation Agenda	)	Docket No. USDA-2020-0008
	)	
	)	

COMMENTS OF THE GPS INNOVATION ALLIANCE

The GPS Innovation Alliance ("GPSIA")[1/] submits these comments in response to the Request for Input ("RFI") issued by the United States Department of Agriculture ("USDA") in the above-referenced proceeding.[2/] As part of the USDA's Agriculture Innovation Agenda ("AIA"), the RFI seeks comment on the most innovative technologies and practices that can be readily deployed to meet the USDA's goal of increasing agricultural productivity while reducing environmental impacts. GPSIA applauds the USDA's ongoing efforts to evaluate the technologies and practices that can facilitate the continued success of American farmers, ranchers, foresters, and producers. As GPSIA previously explained,[3/] the Global Positioning System ("GPS") and other international Global Navigation Satellite Systems ("GNSS") have

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1/ The GPSIA was formed in February 2013 to protect, promote, and enhance use of GPS and Global Navigation Satellite Systems ("GNSS") technologies. Members and affiliates of the GPSIA are drawn from a wide variety of fields and businesses reliant on GPS, including manufacturing, aviation, agriculture, construction, defense, transportation, first responders, surveying, and mapping. The GPSIA also includes organizations representing consumers who depend on GPS for boating and other outdoor activities, and in their automobiles, smart phones, and tablets. The GPSIA recognizes the ever-increasing importance of GPS and other GNSS technologies to the global economy and infrastructure and is firmly committed to furthering GPS innovation, creativity, and entrepreneurship.

2/ *See Innovative Technologies and Practices for the Agriculture Innovation Agenda*, Request for Written Stakeholder Input, 85 Fed. Reg. 55,812 (Sept. 10, 2020) ("*RFI*").

3/ *See* Comments of the GPS Innovation Alliance, Document ID: FSA_FRDOC_0001-0326 (filed Apr. 1, 2019) ("GPSIA Spectrum NOI Comments"); *Current and Anticipated Future Spectrum Requirements for Commercial Agriculture, Forestry, Mining, and Rural Manufacturing*, Notice of Inquiry and Request for Comments, 84 Fed. Reg. 9,078 (Mar. 13, 2019).

become a vital resource to the commercial agriculture, mining, forestry, and rural manufacturing industries. Not only are GPS-enabled technologies critical and irreplaceable parts of our national infrastructure, but they can be, and have increasingly been, deployed in precision farming, ranching, and agriculture, making them one of the best "ready to go" innovations to achieve the USDA's goals. The USDA should recognize the importance of GPS-based technologies as it develops the AIA and support the growth of those technologies through facilitating broadband connectivity and promoting spectrum polices that safeguard its use.

I. GPS TECHNOLOGIES CREATE SIGNIFICANT GAINS IN AGRICULTURAL PRODUCTIVITY AND ECONOMIC BENEFITS

The USDA asks about the existing innovations that would meet the AIA goals and how they can demonstrate both increased productivity and reduced environmental impact.[4/] It also seeks comment on how those innovations target a number of areas, including agricultural productivity and food loss and waste,[5/] and how "ready to go" and adoptable the innovation is based on certain criteria.[6/]

A. GPS is Important to a Variety of Agricultural Industries

GPS is a critical component of current high precision farming techniques that increase agricultural productivity, allowing farmers to do more with less. For instance, as GPSIA and its members have explained,[7/] GPS enables farmers to increase crop yields, cost efficiencies, and environmental sustainability through the precise application of seed, water, fertilizers and

4/ *See RFI* at 55,813 (Question 1).

5/ *See id.* (Question 2).

6/ *See id.* (Question 3) (defining "ready to go" as "a practice, technology, or management approach that is fully developed, has been field tested, has completed independent research trials, is publicly available, and end-user accessible").

7/ *See* GPSIA USDA Spectrum NOI Comments at 2.

pesticides, as well as the efficient use of fuel.[8/] High precision GPS devices also allow for close coordination of agricultural equipment use in the field, greatly reducing costly downtime and delays. Further, GPS-supported devices are used to protect animal health. Precision farming techniques allow livestock producers to monitor individual animal feed consumption, feedlot movement, temperature, lameness or sickness, milk production, meat composition and quality, and weight gain – often without any human intervention or presence.[9/]

Similarly, in open pit mining, GPS-supported devices are used to guide loaders, dozers, drills, and draglines to within centimeters, ensuring precise cuts of rocks and boulders and minimizing waste. GPS devices are also employed in forestry to monitor forest health, facilitate ecological restoration, and reduce fire and other hazards. Equipment manufacturers likewise rely on GPS-supported technologies to improve worker safety, reduce production delays, and protect manufacturing equipment. All of these efficiencies increase productivity, decrease consumer costs, and support agricultural production in a manner that will meet the growing world demand for food while reducing waste.

8/ *See, e.g.*, *Agricultural Intelligence in Your Hands*, Trimble, https://agriculture.trimble.com/ (last visited Nov. 9, 2020) (noting that precision agriculture solutions help farmers "achieve practical changes to maximize profitability across the entire farm operation"); *Precision Ag Technology*, John Deere, https://www.deere.com/en/technology-products/precision-ag-technology/#/ (last visited Nov. 9, 2020) (explaining that "[s]atellite guidance reduces overlap, saving you time, fuel and inputs"); Agriculture, GPS.gov, https://www.gps.gov/applications/agriculture/ (last visited Nov. 9, 2020) ("Today, more precise application of pesticides, herbicides, and fertilizers, and better control of the dispersion of those chemicals are possible through precision agriculture, thus reducing expenses, producing a higher yield, and creating a more environmentally friendly farm.").

9/ Precision Agriculture in Animal Production, USDA National Institute of Food and Agriculture, https://nifa.usda.gov/precision-agriculture-animal-production (last visited Nov. 9, 2020); Sandra Avant, *Precision Ag Tools Help Livestock Producers*, IOWA FARMER TODAY (Jan. 12, 2018), https://www.agupdate.com/iowafarmertoday/news/livestock/precision-ag-tools-help-livestock-producers/article_cb653ac6-f639-11e7-9c02-cbbddc630574.html#:~:text=Beyond%20crops%2C%20precision%20farming%20allows,often%20without%20any%20human%20intervention.&text=%E2%80%9CWith%20precision%20agriculture%2C%20we',what%20each%20one%20is%20doing.%E2%80%9D.

B. GPS Has Yielded and Will Continue to Yield Significant Economic Benefits

The global precision agriculture industry, consisting of GPS-powered hardware, software, and services, has a tremendous market impact and created substantial economic benefits. In 2019, it was valued at $9.56 billion.[10/] Conversely, a recently released report highlighted the negative economic impact on farms if they lost access to GPS technology. Specifically, it found that if farmers lost access to GPS technology due to an outage during the spring planting season, farmers would lose an average of $15.5 billion a year.[11/] Corn and soybeans crops would experience the greatest economic loss ($8.5 billion and $5.1 billion, respectively), because they represent the highest value crops in the United States, followed by spring wheat, cotton, rice, and peanuts.[12/]

The benefits to an individual family farm from using GPS are just as significant. For example, a 2015 study estimated that precision agriculture based on GNSS systems saved farmers between 10 to 15 percent in operating costs and purchased inputs.[13/] A more recent report suggests that GPS-enabled precision agriculture provides an estimated savings of $15 to $25 an acre, meaning a corn-producing farm of 1,000 acres would save $15,000 to $25,000 in operating costs through the use of GPS-supported technology.[14/]

[10/] Global Precision Agriculture Market Analysis by Offering, Technology, Application, by Region, by Country (2020 Edition), Market Study Report (July 31, 2020), https://www.marketstudyreport.com/reports/global-precision-agriculture-market-analysis-by-offering-technology-application-by-region-by-country-2020-edition-market-insights-and-outlook-post-covid-19-pandemic-2020-2025.

[11/] *See* Economic Benefits of the Global Positioning System (GPS), Final Report, RTI International, at 5-14 (June 2019), https://www.rti.org/publication/economic-benefits-global-positioning-system-gps/fulltext.pdf ("2019 RTI Report").

[12/] *See* 2019 RTI Report at 5-14.

[13/] *See* Ira Leveson, The Economic Value of GPS: Preliminary Assessment, at 27 (June 11, 2015), https://www.gps.gov/governance/advisory/meetings/2015-06/leveson.pdf ("2015 Economic Value of GPS Report").

[14/] *See* Keep GPS Working Coalition Adds Agriculture Groups Representing Bulk of US Farmers, Associated Press (Sept. 29, 2020), https://apnews.com/press-release/business-wire/global-positioning-

The benefits of precision agriculture powered by sensors and GPS and GNSS-enabled systems are only expected to grow. Indeed, a study by Global Market Insights found that the value of the precision farming market will exceed $12 billion by 2025, growing at a compound annual growth rate of 15 percent.[15/]

C. GPS Solutions Are "Shovel-Ready"

Of particular value to the AIA, GPS and GNSS-supported technologies in precision farming are "ready to go."[16/] GPS equipment manufacturers have spent years developing and deploying lines of products specifically geared toward improving farming efficiency by incorporating location capabilities into precision agriculture tools and machinery. These products have already undergone testing, been displayed at trade shows, placed on the market, and purchased by thousands of farmers across the country.

Indeed, in recent years, the number of farmers that have turned to GPS-enabled precision agriculture equipment to increase their yields and improve efficiency has grown substantially. For example, GPS-based mapping systems, including yield monitors, are now used on about 50 percent of all corn and soybean farms in the U.S., and guidance and auto-steer systems have been adopted by approximately 33 percent of such farms.[17/] In addition, soil mapping using GPS-derived geographic coordinates and variable rate technology[18/] for applying inputs are used on

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15/ *See* Precision Farming Market Size by Component, Global Market Insights (Apr. 2019), https://www.gminsights.com/industry-analysis/precision-farming-market.

16/ *See RFI* at 55,813 (Question 3).

17/ *See What is Precision Ag?*, TRIMBLE (May 20, 2020), https://agriculture.trimble.com/blog/what-is-precision-ag/.

18/ Variable rate technology allows a machine to adapt its parameters when applying seed, chemical, or fertilizer according to the exact variations in plant growth or soil nutrients and type. *Id.*

between 16 to 26 percent of these farms.[19/] One major producer of "smart" heavy farming machinery estimated that as of 2014, technology that employs GPS on heavy equipment was used on 70 percent of large grain farms, and that number has only grown since.[20/]

Innovative new GPS-based applications are also being developed and deployed all the time. For example, Trimble showcased its new agricultural solutions at AgriTechnica 2019.[21/] Those solutions include new displays and guidance controllers to facilitate auto-steering and application control on farms as well as its next-generation WeedSeeker 2 spot spray system, which provides growers up to 90 percent savings in input costs when targeting and treating herbicide resistant weeds. John Deere similarly displayed at the 2020 Consumer Electronics Show its current and potential new agriculture technologies that will enhance farm productivity, profitability, and sustainability, including its self-propelled sprayer, which uses GPS, remote sensing, machine learning, and other technologies to respond instantly to changes in the wind and reduce herbicide use.[22/] The growth of the Internet of Things, powered by 5G technology, will further improve the quality of data gathering and provide new, more affordable, and accessible use cases – making GPS-reliant solutions accessible and readily available to more farmers than ever before.[23/]

19/ *See id.*

20/ *See* 2015 Economic Value of GPS Report at 27.

21/ *See Trimble Showcases New Ag Solutions at Agritechnica 2019*, TRIMBLE (Nov. 11, 2019), https://investor.trimble.com/news-releases/news-release-details/trimble-showcases-new-ag-solutions-agritechnica-2019.

22/ *See* News Release, *John Deere Exhibits Again at CES 2020, World's Largest Technology Event*, JOHN DEERE (Jan. 8, 2020), https://www.deere.com/en/our-company/news-and-announcements/news-releases/2020/agriculture/2020jan08-deere-exhibits-ces-2020/; John Hearth, *Deere Shows Its Tech at Consumer Electronics Show*, AGWEB (Jan. 9, 2020), https://www.agweb.com/article/deere-shows-its-tech-side-consumer-electronics-show.

23/ *See Precision Agriculture Technology: The Future of Precision Farming with IoT*, DIGITEUM (Aug. 9, 2019), https://www.digiteum.com/precision-agriculture-technology.

II. GPS TECHNOLOGIES SHOULD BE SUPPORTED BY MOBILE BROADBAND

The USDA seeks input on how innovations identified by commenters could be deployed through and reasonably integrated with other USDA programs.[24/] It also asks how the USDA could support the deployment and adoption of the innovation in the field and how the USDA is already supporting its deployment and adoption.[25/]

As GPSIA has explained,[26/] expanded broadband coverage through the deployment of fixed and wireless broadband facilities in rural areas is necessary to ensure that GPS performance in commercial agriculture and other industries remains robust. GPSIA noted that "[w]hen broadband connectivity and GPS technology are combined together, our nation's farmers win by being able to save time, money and unnecessary waste of critical resources."[27/] Similarly, the National Telecommunications and Information Administration ("NTIA") has observed that "[t]apping into broadband wireless networks and embedding information technology (IT) devices in farm machinery such as tractors and harvesters, [will] allow farmers to use 'telematics' to optimize machine use for field preparation, precision planting, water optimization, harvesting and overall production efficiency."[28/]

GPSIA appreciates the efforts that the USDA and the Federal Communications Commission ("FCC") have already taken to support precision agriculture through broadband

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24/ *See* RFI at 55,813 (Question 4).

25/ *See id.* (Questions 5 and 7).

26/ *See* GPSIA USDA Spectrum NOI Comments at 4.

27/ GPSIA News Release, *GPSIA Applauds Enactment of Precision Agriculture Provision in Farm Bill* (Dec. 20, 2018), https://www.gpsalliance.org/precision-ag-enacted.

28/ Broadband USA Newsletter, *Broadband and Precision Agriculture*, at 1 (June 2018) ("NTIA Newsletter"), https://broadbandusa.ntia.doc.gov/sites/default/files/resource-files/bbusa_newsletter_2018_06june.pdf.

deployment. *First*, pursuant to its directive under the 2018 Farm Bill,[29/] the FCC, in consultation with the USDA, established a task force – the Task Force for Reviewing Connectivity and Technology Needs of Precision Agriculture in the United States ("Task Force") – to evaluate the broadband connectivity and technology needs of precision agriculture users in the U.S.[30/] And, since that time, the Task Force has held several meetings and established four working groups to assist with carrying out its work.[31/]

GPSIA supported the enactment of this provision within the Farm Bill, and it is pleased with the progress that the Task Force has made. As FCC Chairman Pai has appropriately recognized, precision agriculture is important to the Nation's economy, and "[t]he FCC must play a constructive role in promoting these efforts and supporting investment in high-speed Internet in ways that specifically help precision agriculture."[32/]

Second, the USDA has established the ReConnect Program, which offers up to $600 million in loans, grants, and loan/grant combinations to facilitate broadband deployment in rural America. ReConnect funding has provided farmers access to high-speed broadband services that enables them to utilize precision agriculture tools and maintain crop sustainability. Minnesota is

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29/ *See* Agriculture Improvement Act of 2018, Pub. L. No. 115-334, § 12511 (2018) (directing the task force, among other things, to identify and measure current gaps in broadband access on agricultural land and develop policy recommendations to address those gaps).

30/ *See FCC Announces the Establishment of the Task Force for Reviewing Connectivity and Technology Needs of Precision Agriculture in the United States and Seeks Nominations for Membership*, Public Notice, 34 FCC Rcd 5057 (2019).

31/ *See FCC Announces the Membership of the Working Groups of the Task Force for Reviewing the Connectivity and Technology Needs of Precision Agriculture in the United States*, Public Notice, 35 FCC Rcd 2053 (2020) (stating that the following working groups will assist the Task Force: (i) Mapping and Analyzing Connectivity on Agricultural Lands; (ii) Examining Current and Future Connectivity Demand for Precision Agriculture; (iii) Encouraging Adoption of Precision Agriculture and Availability of High-Quality Jobs on Connected Farms; and (iv) Accelerating Broadband Deployment on Unserved Agricultural Lands).

32/ News Release, *Chairman Pai Announces Working Groups for Precision Agriculture Connectivity Task Force*, FCC (Mar. 13, 2020), https://docs.fcc.gov/public/attachments/DOC-363042A1.pdf.

just one of the states that will benefit from ReConnect funding. As the President of the Minnesota Farm Bureau Federation recently reported, sustainability is a top priority for farmers and ranchers, and "[p]recision agriculture helps increase that sustainability by using GPS, yield monitors and autosteer."[33/]

Third, the FCC is preparing to make available up to $9 billion in federal support to foster mobile broadband deployment in rural areas and facilitate the adoption of precision agriculture technologies.[34/] Specifically, on October 27, 2020, the FCC adopted an Order establishing the 5G Fund for Rural America ("5G Fund"), which will make federal subsidies available over 10 years to bring voice and 5G broadband services to unserved rural areas, in two phases. Phase I will make available up to $8 billion nationwide to all eligible rural areas that lack unsubsidized 4G LTE and 5G broadband service, and Phase II will make available at least $1 billion – plus any funds left over from Phase I – to specifically target the deployment of technologically innovative 5G networks that facilitate precision agriculture.

GPSIA appreciates and supports both of these funding opportunities. As the agencies continue to carry out these initiatives, GPSIA urges the USDA to recognize the importance of broadband connectivity as a complement to GPS and implement a "whole of government" approach that encourages both the USDA and FCC to work together to support GPS use in precision agriculture.

33/ *USDA Helps Minnesota Agriculture Stay Connected*, RED RIVER FARM NETWORK (Oct. 21, 2020), https://www.rrfn.com/2020/10/21/usda-helps-minnesota-agriculture-stay-connected/ (adding that "[n]ot only do we need it (broadband) at our kitchen tables, but we also need it out in the field").

34/ *See Establishing a 5G Fund for Rural America*, Report and Order, GN Docket No. 20-32, FCC 20-150 (rel. Oct. 29, 2020).

III. GPS TECHNOLOGIES SHOULD HAVE INTERFERENCE-FREE ACCESS TO SPECTRUM

Finally, the USDA seeks input on the barriers to adoption of the innovation that it can help overcome.[35/] In considering potential barriers, the USDA should recognize the unique spectrum needs that support the operation of satellite-based navigation systems like GPS. As GPSIA previously explained,[36/] systems that support satellite navigation functions are especially sensitive to adjacent-band operations in different ways from terrestrial-based systems like cell-phone wireless communications networks. For example, GPS satellites, which orbit more than 12,000 miles above the earth, rely on solar panels to generate the power needed to send GPS signals back to the ground. As a result, GPS satellites transmit with no more power than a 50-watt light bulb, and GPS devices receive signals at a power level that is less than a millionth of a billionth of a watt – substantially *below* the thermal noise floor.[37/]

Terrestrial-based communications networks, on the other hand, operate *above* the thermal noise floor at a significantly higher power level. Indeed, terrestrial mobile wireless broadband base stations can transmit (downlink) signals that can be billions of times stronger than GPS signals. Even mobile broadband handset transmissions (uplink signals) can be billions of times stronger than GPS satellite signals as received on earth when a mobile handset is transmitting in close proximity to a GPS receiver (for example, when the passenger in the front seat of a car with a GPS navigation system is using his or her cell phone).

35/ *See* RFI at 55,813 (Question 5).

36/ *See, e.g.*, GPSIA USDA Spectrum NOI Comments at 8; Comments of the GPS Innovation Alliance, NTIA Docket No. 181130999-8999-01, RIN 0660-XC044, at 8-9 (filed Jan. 22, 2019); *Improving Federal Spectrum Systems*, 114th Cong. 1, at 6 (Oct. 16, 2015) (written testimony of GPSIA), https://docs.wixstatic.com/ugd/a5ea08_187ad436a8ce470991a8389a9fa189c3.pdf.

37/ The thermal noise floor is the measure of the signal created from the sum of all the noise sources and unwanted signals.

Accordingly, because the USDA's AIA implicates spectrum policies, the USDA should seek, through cooperation with its federal partners, to protect navigation services by asking that high-powered communications services be separated from services like GPS that require a "quiet neighborhood." GPSIA previously proposed a "zoning" approach that would group similar services together to the greatest extent possible to minimize the number of band edges or "border areas" where dissimilar uses in close proximity create serious interference challenges.[38/] It also explained that spectrum management policies and rules should employ the internationally established criteria of a 1 decibel ("dB") decrease in Carrier-to-Noise Ratio ("C/N_0") as an interference protection criterion to protect GPS operations. Because the commercial agriculture, mining, forestry, and rural manufacturing industries rely heavily on GPS technologies, it is important that the USDA help to safeguard their full functionality and operations.

IV. CONCLUSION

GPSIA appreciates this opportunity to highlight the importance of GPS and GNSS-based technologies in meeting growing global agricultural needs while reducing the environmental footprint of agriculture. To maximize efficiency while improving output, the USDA should recognize the importance of GPS and GNSS-based technologies – which are already widely deployed – in all parts of the agricultural process and support their use through increasing rural broadband connectivity and preserving their spectrum access.

38/ *See* GPSIA USDA Spectrum NOI Comments at 8.

Respectfully submitted,

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