

Accelerating Broadband Deployment on Unserved Agricultural Lands Working Group

**Interim Report to the Federal Communications Commission
Precision Agriculture Task Force**

March 12, 2021

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Abbreviations:

- Ag – Agriculture or Agricultural**
- FCC – Federal Communications Commission**
- USDA – United States Department of Agriculture**
- RDOF – Rural Development Opportunity Fund**
- BDAC – Broadband Deployment Advisory Committee**

Charge

PRECISION AG CONNECTIVITY TASK FORCE

Accelerating Broadband Deployment on Unserved Agricultural Lands

Working Group Charges

The Accelerating Broadband Deployment on Unserved Agricultural Lands Working Group (Accelerating Deployment Working Group) shall develop recommendations that will allow the Task Force to fulfill its obligations under the following sections of the 2018 Farm Bill and that will allow the Task Force to weigh policies and rules to accelerate deployment on unserved agricultural lands:

- **12511(b)(3)(A)(ii):** Develop policy recommendations to promote the rapid, expanded deployment of broadband Internet access service on unserved agricultural land, with a goal of achieving reliable capabilities on 95 percent of agricultural land in the United States by 2025;
- **12511(b)(3)(A)(iv):** Recommend specific new rules or amendments to existing rules of the Commission that the Commission should issue to achieve the goals and purposes of the policy recommendations described in clause (ii) (i.e., the bullet above);
- **12511(b)(3)(A)(vi):** Recommend specific steps that the Commission should consider to ensure that the expertise of the Secretary and available farm data are reflected in future programs of the Commission dedicated to the infrastructure deployment of broadband Internet access service and to direct available funding to unserved agricultural land where needed.

To carry out this charge, the Accelerating Deployment Working Group shall evaluate:

- Policy recommendations for the Commission, the Department, and federal, state, and local governments intended to promote the acceleration of broadband internet access on unserved agricultural lands;
- How the Commission can reduce and/or remove regulatory barriers to broadband infrastructure investment on agricultural lands;
- How the Commission should allocate and license spectrum for the purpose of accelerating deployment to unserved agricultural lands; and
- In conjunction with the Mapping and Analyzing Connectivity on Agricultural Lands Working Group, specific steps the Commissions should consider to ensure that the expertise of the Secretary and available farm data are taken into account in Commission policymaking affecting broadband deployment on agricultural lands.

The Accelerating Deployment Working Group shall produce draft reports for the Task Force's consideration addressing the topics above at least every 12 months and shall submit each such report to the Task Force and Commission staff at least 30 days prior to the date of the Task Force meeting at which the Task Force will consider the report.

Guiding Principles and Peer Working Group Collaboration

The Accelerating Broadband Deployment Working Group members agreed on core principles within the first few meetings that would guide the research and deliberation that led to recommendations in this report:

- While the working group’s charge is defined as accelerating deployment of broadband to unserved agricultural lands within the context of precision agriculture, group members recognized the effectiveness of precision agriculture on agricultural lands is inextricably tied to the ability to analyze and communicate data from decision making headquarters of individual farms and ranches;
- Determining which agricultural lands are unserved and those that are underserved is predicated on the ongoing efforts by the Federal Communications Commission (FCC), other state and federal agencies and recommendations of the Data and Mapping subgroup to improve the granularity and accuracy of existing data;
- While individual working group members may have personal preferences for technology to deliver broadband, the group agreed to focus on outcomes rather specific technology solutions;
- When assessing use cases and connectivity needs, policies need to focus on building for future, not just current, needs while recognizing the in-field/pasture/rangeland needs may require different quality specifications than headquarters;
- Scalable technology is a pre-requisite for any broadband buildout effort;
- Encourage policies that allow the enduser to afford it and the company to maintain it over time.

The Accelerating Broadband Deployment Working Group collaborated with peer working groups of Adoption and Jobs, Connectivity Needs and Demand, and Data and Mapping in a variety of ways:

- Joint conference calls of working group chairs and vice chairs were convened by the Task Force Chairman to provide status reports and identify areas of overlap and cooperation;
- Three separate joint calls with presentations from each of the other working groups was held with the entire Accelerating Deployment team;
- Team members from Connectivity and Needs met with team members from Accelerating Deployment to discuss issues in common;
- The Deployment Working Group Vice Chairman and Chairman participated in additional fact finding calls with other working groups on issues that were relevant to deployment.

Given the interdependent nature of the working groups’ charges, the Accelerating Deployment team decided to review the other working groups’ reports before making its first round of recommendations.

The Accelerating Deployment Working Group also allocated subgroup time to assessing recommendations of the previously convened Broadband Deployment Advisory Committee. That body of work informed some of the recommendations. Additional background materials ranging from presentations by the FCC to articles in agricultural and technology publications were also reviewed by working group members. These items are listed in Appendix A.

Recommendations

Rationale for Recommendations

<p>A</p>	<p>The FCC should implement geographic buildout requirements, rather than population-based requirements, tied to spectrum auctions with shorter buildout timelines.</p> <p>Precision Agriculture, by its very nature, will require the use of geographical-based buildout instead of the more traditional approach based on population. The spectrum auctions should include a shorter and more aggressive buildout timeline as positive consideration in winning bids.</p>	<ul style="list-style-type: none"> - The FCC has raised billions of dollars in the auction of spectrum for use across the nation, yet we have not seen equivalent build out in rural ag lands in comparison to that in more densely populated areas. Past auctions had geographic buildout as a focus of winning the spectrum auction over a buildout tied to a percentage of population. This change would better ensure coverage in more sparsely populated areas, such as ag lands. - Consider a dual approach that still requires population targets in urban areas while requiring geographic coverage in rural areas. - Often the buildout requirements allow for 10 years to meet auction requirements. Exploring ways to incentivize accelerated buildout timelines to five or fewer years would meet the objective of providing service to unserved areas.
<p>B</p>	<p>The FCC and USDA should ensure that Precision Ag standards are established and followed for all elements of the network. Define multiple precision agriculture performance targets comprising speed and quality metrics such as latency, jitter, and packet loss based on the defined broadband needs of actual agricultural use cases, while considering search capacity and seasonal variations, rather than theoretical offering of specific technology types. Define service availability location and time percentage targets that can be used in industry standard radio frequency propagation models for design and measurement of mobile communication systems across agricultural lands. Consider any and all connectivity technologies (fixed, wireless, satellite) that will satisfy the demands of these targets.</p>	<ul style="list-style-type: none"> - Establishing standards for precision ag allows for building economies of scale and ensuring that the full ecosystem of precision ag can grow and develop from equipment manufacturers to service providers to farm & ranch applications. - The FCC, USDA and other stakeholders should develop broadband performance targets that specifically reflect the needs of agricultural use cases (as defined by the Current and Future Connectivity Demand Working Group). - Several sets of performance targets may be appropriate to account for differences between various use cases (e.g. fixed vs. mobile, consumer Internet access vs. M2M/IoT applications). - The performance characteristics to be measured (speed, latency, etc.) should be based on those that are most salient for the given use case (e.g. some applications may be latency sensitive, where others may be minimally impacted by higher latency). - Specific targets should be tailored to specific use cases (e.g. some use cases may require symmetric speeds, whereas others benefit from higher allocation to download).

<p>C</p>	<p>Ensure that federal agencies use the same threshold for establishing what is considered to be broadband service, including nearly symmetrical service, and ensure all support mechanisms and incentives.</p>	<ul style="list-style-type: none"> - Various federal agencies provide support to build out broadband networks, however the various networks are not in sync with what is considered to meet the threshold of being broadband. A consistent definition would be helpful for ensuring quality networks in rural/ag lands. - The FCC currently acknowledges that a 25/3 Mbps connection meets the threshold for being considered advanced telecommunications capability. However, this threshold has steadily and consistently grown to meet the needs of consumer demand. It is logical to assume that the broadband needs will continue to grow and the supporting networks must have the same scalability. Scalability in this sense would be related to increasing speeds and capacity on the network as consumer demand increases. Ideally, this would be a fiber optic network, but considering timelines and funding, wireless and satellite options could be used in the interim provided the proper specs for precision ag are met as determined by connectivity needs.
<p>D</p>	<p>The FCC should identify and implement policies to facilitate use of low-, mid-, and high-band spectrum for precision agriculture applications, including but not limited to: (i) policies that facilitate access to licensed spectrum in rural areas that may be underutilized; (ii) policies that remove technical impediments to rural agricultural use cases; and (iii) policies that structure future spectrum auctions to increase the likelihood that spectrum can and will be utilized for precision agriculture purposes.</p>	<ul style="list-style-type: none"> - The FCC has held many spectrum auctions in recent years, and this recommendation would be an inclusion for future spectrum auctions. This spectrum would be used in last acre network deployments.
<p>E</p>	<p>The FCC should strengthen policies that require auction bidders to show the long-term sustainability and scalability, including nearly</p>	<ul style="list-style-type: none"> - Broadband network capacity requirements continue to grow exponentially. Therefore, federal funding should support networks that will also scale exponentially and sustain the service for many years. Short-term solutions imply additional funding in regular increments.

	symmetrical service, of their proposed networks.	<ul style="list-style-type: none"> - Ensure that funding meets a balance between the capital costs to deploy as well as the ongoing costs to maintain, upgrade and support the network. - Ensure the bidders have the capability to deliver the service needed in the committed timeline. Otherwise, rural/ag areas will continue to be unserved and tax-payer dollars could be wasted.
F	The FCC should strengthen policy towards use restrictions of unlicensed spectrum to mitigate unnecessary noise in order to better ensure performance for wireless networks.	<ul style="list-style-type: none"> - While there are limitations for use of unlicensed spectrum, this is rarely policed at the local level and unnecessary noise can make an unlicensed spectrum unusable. Enhanced monitoring and rapid dispute resolution would allow better use of unlicensed spectrum in the last acre network application.
G	The FCC and USDA should support rural broadband networks by including incentives for connectivity to rural ag land headquarters.	<ul style="list-style-type: none"> - FCC policy must recognize, consistent with its recent Section 706 reports, that fixed and mobile services are not substitutes but are complementary services needed to support Precision Ag. In the microsystem of a farm this may be seen in the following example: a rancher may rely on remote sensors that track the health, food consumption and activity of its cattle in the field. These will rely on mobile wireless capabilities. At the same time, the rancher may participate in online cattle auctions that rely on high-capacity, low-latency wired broadband services. In this example, the complementary systems of both fixed and mobile services are necessary to support the farm. Moreover, and as expressed in numerous papers and studies, wireless services require wires. At some point, and particularly as 5G is investigated for increasing industrial and other uses, fiber deep into the network will be necessary to provide sufficient backhaul capability. - Headquarters for ag lands can vary substantially between operations and geographic areas from the home-based office to the bin site and input storage areas to the irrigated field or corral. - USDA's programs have been very important to rural broadband growth, from RUS loans to the recent Re-Connect programs with grant and loan components. This recommendation would be to add incentives where farm and ranch headquarters are served by broadband network buildouts.
H	The FCC and USDA should develop policies that incentivize the	<ul style="list-style-type: none"> - Rural fiber networks are one potential solution for middle mile networks to bring the type of capacity of

	<p>expansion of middle mile infrastructure leveraging best in class connectivity such as fiberoptic infrastructure.</p>	<p>farm headquarter facilities to support future Precision Ag. bandwidth needs.</p> <ul style="list-style-type: none"> - Bringing fiber to the home, which in many cases serves as the headquarters of a business, in rural America is financially challenging given the economics of building this infrastructure in lower density areas. - High speed cellular networks such as 5G will need to be part of the solution in bringing high speed broadband to rural America. - The current and future evolution of Precision Ag. technology will result in vast amounts of data that will need to be transmitted across the field as well as to the cloud for effective and efficient farm management decision. - Investments made in rural telecommunication networks should be future proofed to have the capacity of support these significant data needs.
<p>I</p>	<p>The FCC and other stakeholders should explore novel business models, including identifying unnecessary regulations that may be impeding the emergence of those models and the promulgation of new regulatory frameworks to facilitate such business models.</p>	<ul style="list-style-type: none"> - This could include efforts to encourage shared infrastructure models at the middle-mile and last-mile/acre. - Appropriate policies could include further liberalization of the “secondary markets” regimes, and potentially efforts to support wholesale operations that may not fit neatly into federal and state regulatory frameworks. - The FCC’s recent spectrum auction to tribal entities and existing efforts to raise awareness of the opportunities for tribal entities to become or to cooperate with internet providers is encouraged to continue and to be used as a model for other rural areas.
<p>J</p>	<p>The FCC and USDA should work with stakeholders to build a playbook for the creation and operation of rural community-based, non-profit solutions. An important key to the success of these types of solutions is for the entities involved to leverage the expertise of local, independent, existing operators to build these community-based high-speed networks.</p>	<ul style="list-style-type: none"> - Strong community-based organizations exist in every rural farm community across America. These include but are not limited to local economic development and community foundations, farm supply cooperatives, rural water districts, rural electric cooperatives, rural cooperative and family-owned telecommunication companies, and county and municipal government entities. - Many examples exist of successful collaborative efforts bringing broadband to rural areas through community-based models. - Many of these initial community efforts fail due to early conflicts that naturally arise when trying to

		<p>build a community coalition toward a common purpose – often the result of challenges to raise startup capital.</p> <ul style="list-style-type: none"> - Funding incentives could be developed to assist in bringing together these community organizations. By helping to overcome initial barriers faced in these efforts, more grassroots community-based solutions could be realized. This approach can also utilize groups such as Ag Cooperatives to purchase spectrum for use in last mile applications across farms and ranches. - This collaborative, community-based approach could also be leveraged in the deployment of rural wireless networks by aggregating infrastructure and spectrum across a larger area thus lowering deployment costs.
<p>K</p>	<p>The FCC and USDA should facilitate the ability of parties to obtain funding from multiple sources with one not precluding another.</p>	<ul style="list-style-type: none"> - FCC, USDA, and some state programs have not allowed recipients of one program to apply for additional funds from a different program. In the case of agricultural lands and many rural areas that are unserved or underserved, applicants should be encouraged to leverage multiple programs to build out and deliver service. - Agencies should explore options for long-term, sustainable funding of network buildout and upgrades that provide affordable, reliable service to precision ag users. - The USDA has achieved great strides through the Rural Utility Service and Rural Development programs. The Farm Service Agency (FSA) and Natural Resources Conservation Service (NRCS) could also serve as direct conduits for funding resources and training to facilitate deployment and adoption of precision ag infrastructure and tools.
<p>L</p>	<p>The USDA should develop policy to support the buildout of local/last acre network to ensure the capability to use Precision Ag systems and devices.</p>	<ul style="list-style-type: none"> - In addition to existing Rural Utility Service, and Rural Development grant and loan programs, the Farm Service Agency could facilitate efforts by serving as local contacts and establishing loan or grant criteria for those farms that are seeking to build network infrastructure to support their operations. The NRCS could direct conservation funding to farmers who adopt precision ag to enhance their conservation and nutrient management practices. Land Grant Extension services could enhance training and research in precision ag.

<p>M</p>	<p>The Department of Interior’s Bureau of Indian Affairs (BIA) should conclude review of handbooks for program staff to interpret guidelines for buildout of Internet services, distribute the handbooks and accelerate training to field staff. The FCC and BIA should gather input and act on how to streamline regulations pertaining to broadband buildout on tribal lands.</p>	<ul style="list-style-type: none"> - In the case of tribal lands, interviews with multiple providers revealed that the cost of building out Internet service can cost up to 30% more on tribal lands due largely to delays in interpreting guidance related to easements and right of ways. - The guidance was revised in 2016 with a rewrite of the Code of Federal Regulations 169.26 for citing “telephone and telegraph lines; radio, television, and other communications facilities.” - If field staff handbooks and training scheduled for implementation in the spring of 2021 do not show an improvement in efficiency, then the agencies should work together to clarify the CFR for more rapid deployment.
<p>N</p>	<p>The FCC should ensure that the intent of the Broadband DATA Act is met by expanding proof of service beyond one customer in a census block to a percentage of acres and/or geography as companies report their coverage.</p>	<ul style="list-style-type: none"> - Current regulations through Form 477 reporting, allow an Internet provider to claim it serves an entire census block if it provides service to one customer. This does not reflect actual coverage area. Providers should show proof of service to more than half the census block area, especially in the case of serving agricultural lands, to move toward the goal of delivering service to more than 95% of agricultural lands. - Weighting of Farms Served when Contemplating High-Cost Support Allocations The USDA ReConnect program includes “weights” that favor areas with farms. While no rural or high-cost universal service support area should be subject to diminished or deprivation of support for lack of farmland, the USDA program indicates that the Federal policymakers have already recognized the role of broadband in farms, and the role of farms in building local communities. Accordingly, the USDA ReConnect program paves the way for the FCC to offer specific consideration in the USF and CAF high-cost programs for farmland. As described above, this may be accomplished by including the cost of connecting farm fields and facilities to broadband.
<p>O</p>	<p>Federal cyber security and cyber protection policy, adopted by Congress or developed by agencies, should protect precision ag network infrastructure and data that provide for farm property and its products as well as farm record data to be</p>	<ul style="list-style-type: none"> - A joint federal document “Threats to Precision Agriculture” published by the Department of Homeland Security in 2018 concluded that “most of the threats facing precision agriculture’s embedded and digital tools were consistent with threat vectors in all other newly-connected industries...Generally accepted mitigation techniques in other industries

	<p>recognized at a level that is equal to any other independent business entity. It should be recognized that farms and food systems, including their data and records, are a matter of national security. Such property and data should be considered highly sensitive and malicious acts, domestic or international, should be considered a terrorist act in nature.</p>	<p>were found to be largely sufficient for creating a successful defense-in-depth strategy.”</p> <ul style="list-style-type: none"> - Continual application of the Confidentiality, Integrity, and Availability (CIA) model is needed to prevent disruptions or corruption of data and food security as technologies continue to emerge.
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Grid Representation of Charge

The following table of recommendations crosschecks the relevance of each recommendation to the working group’s charge. A detailed description of each element of the working group’s charge is listed below the table.

RECOMMENDATIONS	*FB 3A ii	FB 3A iv	FB 3A vi	Multi Agency Policy	FCC Reg	FCC Spectrum	Joint Expertise
<p>A. The FCC should implement geographic buildout requirements, rather than population-based requirements, tied to spectrum auctions with shorter buildout timelines. Precision Agriculture, by its very nature, will require the use of geographical-based buildout instead of the more traditional approach based on population. The spectrum auctions should include a shorter and more aggressive buildout timeline as positive consideration in winning bids.</p>	x	x		x	x	x	
<p>B. The FCC and USDA should ensure that Precision Ag standards are established and followed for all elements of the network. Define multiple precision agriculture performance targets comprising speed and quality metrics such as latency, jitter, and packet loss based on the defined broadband needs of actual agricultural use cases, while considering search capacity and seasonal variations, rather than theoretical offering of specific technology types. Define service availability location and time percentage targets that can be used in industry standard radio frequency propagation models for design and measurement of mobile communication systems across agricultural lands. Consider any and all connectivity technologies (fixed, wireless, satellite) that will satisfy the demands of these targets.</p>	x	x	x	x		x	
<p>C. Ensure that federal agencies use the same threshold for establishing what is considered to be broadband service, including nearly symmetrical service, and ensure all support mechanisms and incentives.</p>	x	x		x			
<p>D. The FCC should identify and implement policies to facilitate use of low-, mid-, and high-band spectrum for precision agriculture applications, including but not limited to: (i) policies that facilitate access to licensed spectrum in rural areas that may be underutilized; (ii) policies that remove technical impediments to rural agricultural use cases; and (iii) policies that structure future spectrum auctions to increase the likelihood that spectrum can and will be utilized for precision agriculture purposes.</p>	x	x		x		x	x

E. The FCC should strengthen policies that require auction bidders to show the long-term sustainability and scalability, including nearly symmetrical service, of their proposed networks.	x	x		x	x	x	
F. The FCC should strengthen policy towards use restrictions of unlicensed spectrum to mitigate unnecessary noise in order to better ensure performance for wireless networks.	x	x		x		x	
G. The FCC and USDA should support rural broadband networks by including incentives for connectivity to rural ag land headquarters.	x	x	x	x		x	x
H. The FCC and USDA should develop policies that incentivize the expansion of middle mile infrastructure leveraging best in class connectivity such as fiberoptic infrastructure.	x	x		x	x		
I. The FCC and other stakeholders should explore novel business models, including by identifying unnecessary regulations that may be impeding the emergence of those models and the promulgation of new regulatory frameworks to facilitate such business models.	x	x	x	x	x	x	
J. The FCC and USDA should work with stakeholders to build a playbook for the creation and operation of rural community-based, non-profit solutions. An important key to the success of these types of solutions is for the entities involved to leverage the expertise of local, independent, existing operators to build these community-based high-speed networks.	x	x		x	x	x	
K. The FCC and USDA should facilitate the ability of parties to obtain funding from multiple sources with one not precluding another	x	x		x			x
L. The USDA should develop policy to support the buildout of local/last acre network to ensure the capability to use Precision Ag systems and devices.	x			x			x
M. The Department of Interior’s Bureau of Indian Affairs (BIA) should conclude review of handbooks for program staff to interpret guidelines for buildout of Internet services, distribute the handbooks and accelerate training to field staff. The FCC and BIA should gather input and act on how to streamline regulations pertaining to broadband buildout on tribal lands.	x	x		x	x		x
N. The FCC should ensure that the intent of the Broadband DATA Act is met by expanding proof of service beyond one customer		x	x		x	x	x

<p>in a census block to a percentage of acres and/or geography as companies report their coverage.</p>									
<p>O. Federal cyber security and cyber protection policy, adopted by Congress or developed by agencies, should protect precision ag network infrastructure and data that provide for farm property and its products as well as farm record data to be recognized at a level that is equal to any other independent business entity. It should be recognized that farms and food systems, including their data and records, are a matter of national security. Such property and data should be considered highly sensitive and malicious acts, domestic or international, should be considered a terrorist act in nature.</p>		<p>x</p>						<p>x</p>	

***Grid Representation of Charge**

*FB 3A ii	FB 3A iv	FB 3A vi	Multi Agency Policy	FCC reg	FCC spectrum	Joint Expertise
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FB 3A ii = 2018 Farm Bill Section 12511 (b)(3)(A)(ii) – Develop policy recommendations to promote the rapid, expanded deployment of broadband Internet access service on unserved agricultural land, with a goal of achieving reliable capabilities on 95 percent of agricultural land in the United States by 2025.

FB 3A iv = 2018 Farm Bill Section 12511 (b)(3)(A)(iv) – Recommend specific new rules or amendments to existing rules of the Commission that the Commission should issue to achieve the goals and purposes of the policy recommendations described in the clause (ii)

FB 3A vi = 2018 Farm Bill Section 12511 (b)(3)(A)(vi) – Recommend specific steps that the Commission should consider to ensure that the expertise of the Secretary and available farm data are reflected in future programs of the Commission dedicated to the infrastructure deployment of broadband Internet access service and to direct available funding to unserved agricultural land where needed.

Multi Agency Policy = Facilitates development of policy recommendations for the Commission, the Department, and federal, state, and local governments intended to promote the acceleration of broadband infrastructure investment on agricultural lands.

FCC Reg = Facilitates the Commission in reducing and/or removing regulatory barriers to broadband infrastructure investment on agricultural lands.

FCC Spectrum = Facilitates the Commission in allocating and licensing spectrum for the purpose of accelerating deployment to unserved agricultural lands.

Joint Expertise = In conjunction with the Mapping & Analyzing Connectivity on Agricultural Lands Working Group, facilitates specific steps the Commission should consider to ensure that the expertise of the Secretary and available farm data are taken into account in Commission policymaking affecting broadband deployment on agricultural lands.

Additional Support for Accelerating Broadband Deployment

(assisted by Julie Bushell and Mike McCormick with the Adoption/Jobs Working Group)

American farmers and ranchers work tirelessly to produce wholesome, safe, nutritious food, fuel, fauna and fiber across the United States. More than four hundred commercial crops become products including fresh produce, grains, nuts, animal proteins, dairy, and forage crops are grown through American agriculture year after year, season after season, in a wide variety of landscapes and climates. The adoption of precision agriculture and the availability of high-quality jobs on the farm are necessary components to maintain American leadership in agriculture.

Like the combustion engine, electrification, and municipal water supply systems before it, access to e-connectivity will shape the future and health of American agriculture. Affordable connectivity to farm structures and in the field is critical for precision agriculture adoption and the continued availability of high-quality jobs on the farm and rural communities.

Data networks, the key facilitator of precision agriculture, are operating to gather, calculate, and report intelligence from within agriculture production. These offer fiscal efficiency, superior environmental practice, and responsible resource allocation, leading to higher yields of safe and wholesome food, fiber, fauna and fuel products.

Connectivity must be deployed to sustain the capacity needs of the industry now, but more importantly into the future. Connectivity goals must be grounded in the need to support evolving precision agriculture applications. Current and future “next generation” precision agriculture technologies, however, require services that allow for greater upload of collected data. As the 2 volumes of data to manage agriculture production increase, higher speeds will likely be necessary, requiring symmetrical data flows, with a better balance of download and upload speeds and reliability. Networks should be built for peaks, not averages. Just as highways are built to accommodate rush hour traffic rather than 12:00 a.m. traffic, broadband networks must similarly be designed to accommodate the full load of anticipated current and future demand. Building to peak demand is not excessive; rather, it is smart design that enables the network to be leveraged to enable fulfillment of precision ag’s complete capabilities. As bandwidth increases so will application development, and many of those applications will be in the agricultural realm. Historically, every major advance in bandwidth has facilitated innovation that has brought new services and applications to digital life.

A variety of technology platforms exist today that can provide Connectivity to the Acre. The idea of a single point network to the farm house, shop, or barn is no longer feasible. Today’s agriculture producers require multipoint, high capacity networks across their acreage.

- High Capacity - Precision agriculture produces large amounts of raw data including shape files, high definition satellite and drone imagery, and rapidly reporting network data points. A high capacity network is able to capture, secure, and transfer these robust data inputs and outputs.
- Reliability - Agricultural data inputs and outputs can indicate critical action items for the producer. Network reliability is of utmost importance when considering valuable resources including: time, fuel, feed, water, domestic animals, fertilizers, herbicides, and pesticides. America’s farmers and ranchers cannot be asked to use a network that is unreliable.
- Data Network Symmetry - Agriculture production utilizes both downstream and upstream networking. Implementation of a network that provides download and upload capacity

symmetrically or at a near symmetrical level is critical to precision agriculture adoption. The agricultural producer's data outputs are just as decisive as their inputs. As equipment continues to become connected, this becomes increasingly important.

- Scalability - Utility infrastructure in general is costly to build, repair, and replace.

Consideration to the scalability of any new network should be considered. The evolution of data networks is far from over. A simple backward view over the last two decades from 56K dial up internet to current 1 gigabit offerings is a telltale window into network requirements to come. Any new network deployed in today's environment must take into account throughput growth rates, and an exponential increase of devices and data streams utilizing the network during its lifespan.

- Fiscal Investment - Agriculture production by percentage is conducted primarily in rural environments with low population densities. These low-density environments offer low cost recovery opportunities per network mile. Utility infrastructure must take into account the life of the network, repair and maintenance costs, and funding sources. Network investments must be future ready and upgradeable. Agriculture production takes place in high cost construction environments.

American agriculture has a tremendous challenge and responsibility to produce enough food to feed the domestic and international population, while conserving resources and taking care of the environment. Increased precision agriculture utilization will help American producers meet that challenge. The success of this undertaking will call upon the actions of Congress, the FCC and the USDA to help create incentives and programs that will sustain American agriculture, farmers, and ranchers in this century and beyond. Moreover, and as an overarching perspective, rural broadband is critical to the viability of rural America, including the exponential benefits to job growth and availability for all job sectors.

Working Group

Composition

All working group members were nominated through the process that closed in July 2019 and vetted by the FCC before being notified of their service in early 2020. Chairman and Vice Chairman were notified in late November 2019 ahead of the Full Task Force briefing that took place December 2019.

LAST NAME	FIRST NAME	ORGANIZATION	LEADERSHIP
Bivens	Renee	Dish	
Buser	Dr. Michael	USDA Liaison	
Cruikshank	Brian	FCC Liaison	
Deryckx	Luke	Ookla	
Dillard	Anthony	Choctaw Nation of Oklahoma	
Ferraro	Stacy	FCC Liaison	
Ganssle	Craig	FarmWave	
Garry	Lauren	FCC Liaison	
Goldman	David	SpaceX	
Hampton+Knodle	Heather	American Agri-Women	Vice Chairman
Huber	Betsy	National Grange	
Hunnicut	Zach	Nebraska Farm Bureau	
Jachman	Jesse	FCC Legal Advisor, Wireline Competition Bureau	
Pettit	Jeff	National Association of Tower Erectors	Chairman
Taubman	Jarrett	Viasat (3/20-9/20 Facebook)	
Thomasson	Dr. Alex	Mississippi State University (3/20-6/20 Texas A&M)	
Todd	Jimmy	Nex-Tech	
Vail	Steve	NineStar Connect	
Watermeier	Dan	Nebraska Public Service Commission	

Timeline

The first Accelerating Deployment of Broadband Working Group meeting was held March 23, 2020 via conference call. The entire working group met on a biweekly basis, except August 11 and December 22, until the interim report was approved for submission to the Precision Agriculture Task Force in February 2021. Meetings transitioned to a Microsoft Teams platform starting in June 2020. Additional subgroup meetings took place as needed to dive more deeply into issues and work through topics of interest.

Process

The Chairman represented the Working Group in full task force discussions and identified key issues. The Vice Chairman drafted agendas, notified members, provided background information and minutes, and scheduled joint meetings with other working groups, agencies or presenters. Members facilitated subgroups to hone topics. Consensus was used to submit recommendations to the full Task Force.

Going Forward

The Charter for the Precision Agriculture Task Force and resulting charges for the working groups require a report on an annual basis. Pending input from the Task Force, the Accelerating Deployment Working Group could explore additional issues related to its charge that include, but are not limited to, the following items.

Issues

5G Buildout – In December 2020, the FCC’s 5G auction set a record. The concern for rural America is that 5G is expected to build on the foundation of existing networks. Existing networks consistently underdeliver stated capacity on agricultural lands. The future of precision agriculture, in particular the interoperability of equipment manufacturers’ data gathering with farm management software and emerging platforms to track environmental practices that will be required for carbon and other eco-related markets are mostly reliant on cellular service for gathering, analyzing and disseminating data.

Accountability – If an auction winner or grantee through any program (Rural Development Opportunity Fund, Connect America, other grants and loans) does not deliver on its commitments, it is unclear when awarded areas will be eligible to compete for additional federal funding. Research the timeline for accountability of 10 years and other requirements to determine impacts on precision agriculture.

Determine how to measure broadband delivery in a way other than people and residences in metrics that capture precision agriculture usage. Collect information from endusers on mapping and precision agriculture needs. Create mechanisms for providers to serve measurable outcomes such as agricultural headquarters. Ensure that spectrum winners, wireless deployments and all technologies account for success of buildout in existing and new areas.

Formalize Existing Relationship - FCC and USDA should enter into a Memorandum of Understanding to fully collaborate on all aspects of rural broadband to support U.S. agriculture. Interagency collaboration has led to several breakthroughs in mapping as well as identified opportunities for fine tuning programs. Rural America and precision agriculture will benefit from ongoing exchange and teamwork between agencies.

Enacting Previous Recommendations – While the working group reviewed a range of material, it was noted that several actionable items remained from the Broadband Deployment Advisory Committee’s earlier work:

1. The FCC should work, either on its own or via the BDAC, with industry and state/local agencies (or national associations) to develop a broadband readiness checklist.
2. The FCC should either develop or encourage states to develop a process by which localities can certify that they are “broadband ready.”
3. Standardized application process across all federal agencies.
4. Historic and environmental review processes should be harmonized across agencies and eliminate duplication of reviews.
5. Name a single point of contact for each federal agency for application review and follow-up and online tracking of the application status.

Funding for Broadband Deployment to Rural Areas to Support Precision Agriculture - Industry practitioners agree that the full potential of precision agriculture can only be realized when robust broadband service is provided to the headquarter level of farms, ranches and other food and fiber supply chain businesses. The primary mechanism for implementing the universal service mandates of the Telecommunications Act of 1996¹ is the Universal Service Fund and Connect America Fund² programs that are administered by the FCC. Especially in rural areas served by small, locally operated providers, these programs have enabled admirable broadband achievement. These programs, however, are funded by an assessment on interstate and international end-user telecommunications revenue. As this revenue base is recognized increasingly as shrinking with the expanded adoption of broadband, there is a clear and recognized need to ensure that the funding base for the FCC High Cost Fund is sustainable.

¹ Telecommunications Act of 1996, Pub. L. No. 104-104. 110 Stat. 56 (1996). The 1996 Act amended the Communications Act of 1934.

² The High Cost Fund is one of four funding mechanisms funded by the Universal Service Fund.

Appendix A – Selected Sources Researched by Working Group

A Case for Rural Broadband: Insights on Rural Broadband Infrastructure and Next Generation Precision Agriculture Technologies – USDA 4/19

“Agriculture Equipment Manufacturers Mobility 2050 Vision” - 4/21/20

BDAC State Model Code for Accelerating Broadband Infrastructure Deployment and Investment – Draft 12/06/18

BDAC: Report of the Removal of State and Local Regulatory Barriers Working Group – 1/10/18

BDAC: Streamlining Federal Siting Working Group – 1/18

“Big Ideas Born in the Field” – AgWeb 11/5/20

Coalition to Advance Precision Agriculture – Industry Summary 3/25/20

“Data-Drive Advances in Agriculture” - K. Sudduth, USDA ARS 4/20

“Disconnected: Seven Lessons on Fixing the Digital Divide” – Federal Reserve Bank of Kansas City

“The Economic Impact of Rural Broadband” Revised Edition – Hudson Institute 4/16

Establishing the Digital Opportunity Data Collection: Second Report and Order and Third Further Notice of Proposed Rulemaking – WC Docket No. 19-195; Modernizing the FCC Form 477 Data Program – WC Docket No. 11-10 – 6/25/20

FCC-20- 50A1

FCC-20-89A1 T-Band NPRM and Public Safety T-Band Fact Sheet - 9/18

FCC-20-89A2 Commissioner Rosenworcel Statement

FCC-21-20A1 Rules to Improve Broadband Data Mapping

“History: The Story Behind America’s Electric Cooperatives and NRECA” - 4/15/20

“Improving and Increasing Broadband Deployment on Tribal Lands Report to the FCC” - Native Nations Communications Task Force 11/19

“Impact of Broadband Penetration on U.S. Farm Productivity” – K. LoPiccolo, FCC 12/15/20

Interview with Chickasaw Nation Fiber Buildout Manager – 7/24/20

Interview with FCC Office of Native Affairs and Programs – 9/4/20

“Income and Internet Access” – Pew Research 5/7/19

“Lessons from Open-Access, Middle-Mile Networks” – Benton Institute for Broadband and Society

“NTCA-USF Study” – Williams, Michael A. and Zhao, Wei with Berkley Research Group 5/20

“Overview of Internet Service Provider Technology Considerations for Rural Broadband Deployments” - Microsoft 11/19

“Precision Agriculture Boosts Land Values for Users” - Morning Ag Clips 7/20

Quiet Zones - Electronic Code of Federal Regulations (eCFR Title 47, Chapter 1, A, Part 1, F 1.924)

Report of the Competitive Access to Broadband Infrastructure Working Group to the FCC BDAC – 1/18

Risk Management Framework Online Training - guidance NIST Special Publication 800-37, Revision 2

Rural Utility Service “Your Partner in Prosperity” Presentation - Chad Rupe, RUS Administrator 4/20

“Setting the Record Straight on Precision Agriculture Adoption” - Lownberg-DeBoer, Erickson; Agronomy Journal Volume 3, Issue 4, 2019

Small Business in Agriculture presentation – Farmwave, C. Ganssle 4/14/20

“Special Broadband Insert” - Rural Electric Magazine 12/19

Statement of Chairman Ajit Pai, FCC “Oversight of the Federal Communications Commission” before the U.S. Senate Committee on Commerce, Science and Transportation – 6/24/20

“Threats to Precision Agriculture” – 2018 Public-Private Analytic Exchange Program, Department of Homeland Security

United Soybean Board and NTCA (National Telecommunications Cooperative Association) Webinar - 8/13/20

Use Case Scenarios from Maine, Illinois and Alabama - 4/20

Use Case Study with M. Splitter – 5/20

Utility Lease Model - Brookings Institute 2/20

“Wireless Needs Wires” - NTCA Article 8/20