No. 142, Original

In the
Supreme Court of the United States

STATE OF FLORIDA,

Plaintiff,

v.

STATE OF GEORGIA,

Defendant

Before the Special Master

Hon. Ralph I. Lancaster

BRIEF OF *AMICUS CURIAE* GEORGIA FARM BUREAU FEDERATION

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TABLE OF CONTENTS

Page

I. Preface: The Future of Farming in Southwest Georgia – A Step Backward 1

II. Introduction 2

III. The Significance of Farming in Georgia 5
- A. History and Role in the Economy 5
- B. Georgia Farm Bureau Federation's Interests in this Case and Dedication to Water Issues 6

IV. The Future of Farming in Southwest Georgia – A Path Forward 8
- A. Advances in Irrigation and Conservation 8
- B. The Broad Reach of Farming to Other Industries 18

V. Conclusion 23

I. Preface: The Future of Farming in Southwest Georgia – A Step Backward

It's 5:30 a.m. on August 14, 2020. John and Ann Brown, along with their 21-year-old son and 19-year-old daughter, rose early, as they did each day that summer. Much work is to be done on the 750-acre cotton, peanut, and sweet corn farm in southwest Georgia. The morning is hot, and the afternoon will be scorching, like so many others this summer.[1] *John is the seventh generation of his family to farm these acres.*[2] *His father and grandfather fought through many summers like this.*

Back in the 1970s, John's grandfather had been one of the first farmers in the region to an install irrigation system in one of the farm's larger fields.[3] *At the time, the idea seemed miraculous. John well remembers running through the water and mud the first time the system was "cranked up." The previous summer had been hot and dry, and farmers were desperate for a crop. Some of the farmers banded together to try last-ditch ideas, like "seeding" clouds with zinc pellets,*[4] *and hoped that the rains would come. They didn't. The yields that fall were sparse. Many farms failed; this one just barely held on.*

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[1] The record high temperature for Albany, Georgia, for example (located in southwest Georgia), is 100 degrees. The average high for August 14 in Albany is 92 degrees, and the actual high on August 14, 2016 was 95 degrees. Weather Underground, Weather History for KABY – August, 2016, https://www.wunderground.com/history/airport/KABY/2016/8/14/DailyHistory.html?req_city=Dawson&req_state=GA&req_statename=Georgia&reqdb.zip=39842&reqdb.magic=1&reqdb.wmo=99999.

[2] *See* Wildman, Mark, *UGA Ag School Dean Tours South Georgia Diversified Farm*, GEORGIA FARM MONITOR (Aug. 12, 2016), *available at* http://www.gfb.org/agnews/story.asp?RecordID=6237 (video seventh-generation farmer from Berrien County, Georgia).

[3] C.M. Stripling Irrigation Research Park, *Agricultural Water Conservation*, http://striplingpark.org/agricultural-water-conservation/ (last visited Oct. 21, 2016) ("Farmers began implementing center pivot irrigation systems in Georgia in the 1970's . . . .").

[4] Practices like cloud seeding are no longer thought of as effective in bringing on or enhancing rainfall. *See* Am. Friends of Tel Aviv Univ., *"Cloud seeding" not effective at producing rain as once thought, new research shows*, SCIENCEDAILY (Nov. 1, 2010), *available at* https://www.sciencedaily.com/releases/2010/11/101101125949.htm.

Despite the increased costs, John's family, and many others, prudently invested in increased acreage under irrigation in the 1970s and going forward, knowing that the crops would produce a reliable yield.[5] *Over just a few decades, irrigation systems got more and more efficient – a vast improvement over the early systems installed by John's grandfather.*[6]

Now, in 2020, the farm looks very different. The first year of the "Florida water cuts" had not been too bad. That spring and summer had seen adequate rains. This summer was different – days of hot, dry, 100-degree weather, with no end in sight. The irrigation equipment is sitting in the field. John and Ann are still paying off the loans for the retrofits that increased the system's efficiency,[7] *but on many days the systems sit idle due to the limited water availability. John hopes that the rains will come. Otherwise, the crop may not be worth harvesting. Wistfully, he realizes that an eighth generation working this land seems unlikely; his son and daughter will not have the same opportunities.*

II. Introduction

The future of farming in southwest Georgia looks remarkably different under the equitable apportionment scheme envisioned by the State of Florida. Farming has been the anchor of this region for hundreds of years. The Brown family

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[5] Gary L. Hawkins & Kerry Harrison, *Water Meters as a Water Management Tool on Georgia Farms*, UGA Extension Bulletin 1296 (Apr. 2015), at 1, *available at* http://extension.uga.edu/publications/detail.cfm?number=B1296 (stating "agricultural irrigated acres in Georgia have increased from fewer than 200,000 acres in 1970 to more than 1.5 million in 2004").
[6] *Agricultural Water Conservation*, *supra* note 3 (describing significant improvements in efficiency of irrigation systems).
[7] *See id.* (discussing increased efficiency of up to 20 percent).

described herein represents thousands of families in southwest Georgia, generations of which have farmed this land.[8] These families, and the communities built around them, rely upon the existing water supply from the Flint River Basin. If access to water for irrigation disappears, farming disappears, and the communities of southwest Georgia disappear.

The Georgia Farm Bureau Federation ("Farm Bureau") files this brief as an *amicus curiae* to illustrate the necessity of irrigation for the farming communities of southwest Georgia, Georgia farmers' record of being on the forefront of water conservation efforts, and the historical and ongoing importance of farming to Georgia's citizens and economy – most especially, the rural economies of southwest Georgia. More than half of the counties in the Flint River Basin are designated by the U.S. Department of Agriculture as "persistently poor" counties.[9] These same rural counties[10] depend completely on agriculture; a reduction in or elimination of irrigation would likely send these counties over the tipping point into collapse.

Accordingly, Farm Bureau submits this brief with specific focus on the importance of irrigation to southwest Georgia. In this agriculturally-dependent

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[8] The farming family described herein is based on the experiences of hundreds of thousands of members of Farm Bureau, and more specifically those in southwest Georgia.

[9] *See* U.S. Dep't of Agric., Econ. Research Serv., *Rural Poverty & Well-being: Geography of Poverty*, http://www.ers.usda.gov/topics/rural-economy-population/rural-poverty-well-being/geography-of-poverty.aspx (last visited Oct. 21, 2016) (noting USDA Economic Research Service has "defined counties as being persistently poor if 20 percent or more of their population were living in poverty over the last 30 years"). Under this definition, there are currently 353 "persistently poor" counties in the United States, and 60 of those are in Georgia. *Id.*; U.S. Dep't of Agric., Natural Res. Conserv. Serv., *USDA StrikeForce Initiative in Georgia*, http://www.nrcs.usda.gov/wps/portal/nrcs/detailfull/ga/programs/financial/?cid=nrcs144p2_021773 (listing Georgia's 60 StrikeForce counties).

[10] These counties are: Baker, Calhoun, Clay, Colquitt, Crisp, Decatur, Dooly, Early, Grady, Macon, Miller, Mitchell, Peach, Randolph, Seminole, Stewart, Sumter, Talbot, Taylor, Terrell, Turner, and Webster. *See id.*

region, the climate, soils, and types of crops grown often require irrigation,[11] and the regional economy (and its contribution to the state's economy and international commerce) depends heavily on the success of each farm.[12]

Farming in southwest Georgia, and the related industries it supports, are dependent upon the use of water in the Flint River Basin for irrigation. The harm that may result from disrupting current uses is "certain and immediate";[13] each summer, with no irrigation, could translate into a sharp reduction in crop yield of row crops including cotton, peanuts, corn, soybeans, and grains. "'Water use has a $2.5 billion impact on the economy of Southwest Georgia. Agriculture is about 80 percent of the economic engine in these rural counties.'"[14] Georgia's farmers are already taking reasonable – and significant – conservation measures to prevent waste of their water resources;[15] in fact, Georgia is recognized globally as a leader in conservation technology. All of the factors discussed herein are relevant to the Special Master's equitable apportionment considerations.[16]

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[11] For example, approximately 77 percent of Georgia's corn is irrigated. Univ. of Ga. Coll. of Agric. & Envir. Scis. [hereinafter "UGA CAES"] Cooperative Extension, Crop & Soil Scis., *A Guide to Corn Production in Georgia 2016* (Lee, Dewey, ed.), at 1, *available at* http://www.caes.uga.edu/commodities/fieldcrops/gagrains/documents/2016CornProductionGuide.pdf.

[12] The Georgia General Assembly has found that "the use of water resources for agricultural purposes is of vital importance to Georgia and southwest Georgia in particular." O.C.G.A. § 12-5-541(b) (Flint River Drought Protection Act).

[13] *See Colorado v. New Mexico*, 459 U.S. 176, 187, 103 S. Ct. 539, 547 (1982) ("We recognize that the equities supporting the protection of existing economies will usually be compelling. The harm that may result from disrupting established uses is typically certain and immediate . . . .").

[14] Ga. Farm Bureau, *GFB hosts water tour for EPD Director Dunn* (Aug. 10, 2016), http://www.gfb.org/agnews/story.asp?RecordID=6233 (quoting Mark Masters, director of the Water Planning and Policy Center at Albany State University).

[15] *Colorado v. New Mexico*, 459 U.S. at 187-88, 103 S. Ct. at 548 ("In the determination of whether the state proposing the diversion has carried this burden, an important consideration is whether the existing users could offset the diversion by reasonable conservation measures to prevent waste.").

[16] *Id.* at 188, 103 S. Ct. at 548 (noting appropriateness of considering "factors relevant to a just apportionment, such as the conservation measures available to both states and the balance of harm and benefit that might result from the diversion sought").

III. The Significance of Farming in Georgia

A. History and Role in the Economy

Farming, Georgia's oldest and largest industry, has driven Georgia's economy for almost three centuries,[17] and remains the foundation of Georgia's economic well-being.[18] Row crops in particular play a significant role in the state's economy, as well as the state's role in the national economy.[19] Georgia produces nearly half of the nation's peanuts, and harvested the second highest cotton acreage in the U.S. in 2014, among other things.[20] Food and fiber production and related processing generate a total economic contribution of $74.3 billion to Georgia's economy and account for more than 411,500 jobs.[21] Row and forage crops alone account for $12 billion of the state's economy and nearly 76,000 jobs.[22]

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[17] Ga. Farm Bureau, *Agriculture – Georgia's $74 Billion Industry* http://www.gfb.org/aboutus/georgia_agriculture.html (last visited Oct. 12, 2016); *see also* Flatt, William P., *Agriculture in Georgia: Overview*, NEW GEORGIA ENCYCLOPEDIA, http://www.georgiaencyclopedia.org/articles/agriculture-georgia-overview (last visited Oct. 6, 2016) ("Agriculture has played a dominant role in Georgia's economy for more than two and a half centuries, beginning with the settlement by English colonists, led by General James E. Oglethorpe, in Savannah in 1733. One of the major goals of the colonists was to produce agricultural commodities for export to England.").

[18] *See* UGA CAES, *2016 Ag Snapshots: A brief focus on Georgia's agricultural industry*, at 2, *available at* http://www.caes.uga.edu/center/caed/AgSnapshotDownloads.html (last visited Sept. 28, 2016) [hereinafter *2016 Ag Snapshots*] (reporting 2014 total farm gate value as $14 billion, an increase from $13.6 billion in 2013); *accord* Center for Agribusiness & Econ. Dev., *2014 Georgia Farm Gate Value Report* (Sept. 2015), at i, *available at* http://www.caes.uga.edu/center/caed/pubs/documents/2014UGACAEDFGVR_FINAL.pdf.

[19] *2016 Ag Snapshots*, *supra* note 18, at 4 ("Row and forage crops have traditionally been the backbone of south Georgia agriculture.").

[20] *Id.*

[21] *Id.* at 3 ("Food and fiber production and directly related processing directly and indirectly generated a total economic contribution of $74.3 billion for the state and accounted for more than 411,500 jobs in 2014.").

[22] *Id.* at 4.

B. Georgia Farm Bureau Federation's Interests in this Case and Dedication to Water Issues

Farm Bureau is an independent, non-governmental organization, formed in 1937 by 50 farmers;[23] now, it has 159 county organizations and more than 300,000 member families.[24] It is the largest farm organization in Georgia, and provides a united voice for farmers to promote farm markets and provide leadership to Georgia's agricultural community.[25] As a grassroots organization, Farm Bureau is the sum of its members, who are primarily farm families in rural communities and individuals working to make Georgia "agriculturally successful, progressive, and prosperous."[26]

Water is as important to Farm Bureau as it is to the farmers it represents. Farm Bureau has been engaged in the creation of all of the state's regional water plans, formed a Water Commodity Committee, and is heavily engaged in the passage of state conservation legislation. Water conservation is consistently emphasized on Farm Bureau's annual "Priority Issues," approved by its Board of Directors.[27]

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[23] *Id.*
[24] Ga. Farm Bureau, *About Georgia Farm Bureau*, http://www.gfb.org/aboutus/default.html (last visited Sept. 19, 2016).
[25] *Id.*
[26] *Id.*
[27] *See, e.g.,* Ga. Farm Bureau Fed'n, *2016 GFB Priority Issues*, *available at* http://www.gfb.org/legislative/ref/GFB_2016_priority_issues.pdf (listing as priorities to Farm Bureau, *inter alia*: "[s]upport[ing] reasonable water conservation measures while enhancing agricultural water supplies so that Georgia farmers remain competitive with producers from neighboring states," "[p]rovid[ing] legislative assistance to agencies that provide water and other natural resource related services to farmers," and "[c]ontinu[ing] participation in the Regional Water Councils and Metro Water District").

Among its legislative efforts, Farm Bureau supported the passage of the Water Planning Act of 2004, which authorized the Environmental Protection Division and the Department of Natural Resources to create a water management plan for the Georgia Water Council to consider, approve, and offer to the Georgia General Assembly, which the Governor signed in 2008.[28] This Comprehensive Statewide Water Management Plan created ten Regional Water Councils to oversee preparation of regional water development and conservation plans.[29] Farm Bureau supported the Regional Water Council process and requested farmers' inclusion in it.[30] Farm Bureau nominated 88 farmers to serve on the Regional Water Councils, and 47 of those farmers were appointed to various committees.

Farm Bureau also promoted the passage of amendments to the Flint River Drought Protection Act, which, among other things, mandate irrigation efficiencies by requiring "all agricultural [water] withdrawal permits in the Flint River Basin to achieve irrigation application efficiencies of at least 80 percent by 2020."[31] The amendments also address protection of vulnerable aquatic life and their habitat.[32]

Farm Bureau remains a grassroots organization, and its farmers are engaged, future-minded, and eager to promote agriculture into a new era of success.

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[28] Ga. Farm Bureau, *Regional Water Councils*, http://www.gfb.org/legislative/water/ (last visited Oct. 3, 2016).
[29] *Id.*
[30] Letter from Zippy Duvall to Sen. John Bulloch (Nov. 11, 2008), *available at* http://www.gfb.org/legislative/ref/bulloch_letter_11-11-08.pdf (noting Farm Bureau members' active involvement in planning phase of statewide water management plan and requesting their inclusion in the regional water councils).
[31] Ga. Farm Bureau Fed'n Legis. Report (Mar. 27, 2014), at 2, *available at* http://www.gfb.org/legislative/ref/GFB_2014_session_end.pdf.
[32] *Id.* *See also* O.C.G.A. § 12-5-541 (stating legislative intent behind the Flint River Drought Protection Act).

IV. The Future of Farming in Southwest Georgia – A Path Forward

A. Advances in Irrigation and Conservation

August 14, 2020: Another blistering day in southwest Georgia, and the farms are in desperate need of rain. Despite the drought this summer, John knows his farm will make a crop. He and many other farmers in the region have made the investments in irrigation necessary to ensure the crop will grow and produce a harvest, even when the skies don't cooperate. He remembers his grandfather talking about that expensive first irrigation system back in the 1970s. The most recent center pivot system installed on the farm cost nearly $100,000.[33] *But irrigation has been worth it, in so many ways. Now, the banks won't think about extending crop loans to farmers for non-irrigated land.*[34]

Those initial irrigation systems were crude compared to what is used now. As rudimentary as they were, though, the results were tangible. In the1970's, farmers began implementing center pivot irrigation systems in Georgia.[35] Those systems "operated at high pressure with impact sprinklers spraying water from the top of the pivot mainline."[36] Today's systems are converted from high to low pressure with low-pressure sprinklers on drop hoses, generating significant water

[33] The Flint River Soil and Water Conservation District (hereinafter "Flint River SWCD") estimates the approximate cost of a new center pivot system as between $70,000 and $100,000, excluding the cost of drilling the well needed for center pivot irrigation.
[34] *See* Ga. Farm Bureau, *GFB hosts water tour for EPD Director Dunn*, *supra* note 14 ("[GFB President Gerald] Long explained how banks take into consideration a farmer's ability to irrigate his crops when loaning the farmer money to plant his crop for the coming year. 'When we go to the bank to get financing, one of the first things they want to know is how much irrigation we have and about our access to water,' Long said. 'Commodity prices are at all-time lows so irrigation is critical to us.'").
[35] *Agricultural Water Conservation*, *supra* note 3.
[36] *Id.*

and energy savings.[37] Retrofitting a pivot generates an average water savings of twenty percent.[38]

By the 1990s, most farmers could not get a crop loan to plant acreage on non-irrigated land.[39] Too many acres had withered in the sun for lenders and farmers to risk planting substantial acreage on dry land. For southwest Georgia, the costs of *not* irrigating exceed the costs of implementing irrigation systems. While the outlay for irrigation is high, the ultimate cost per item of crop output is lower because irrigation increases crop yield.[40]

The new systems are certainly more efficient. John and Ann have attended dozens of conservation workshops to learn about the latest nozzles, ideal moisture rates, and variable rate technology. Their son is teaching them how to monitor soil moisture levels and control their irrigation systems remotely – something John's grandfather certainly did not fathom when he installed the first irrigation system on the farm only a few decades ago. John doesn't have to rely only on gauging rainfall amounts before making the decision to "crank up" the irrigation system; precision technology now available gives him a better picture of just how much water is needed, and when. John is glad there are now ways to avoid over-irrigating the crops; it's better for the crops, the environment, and of course, his energy costs.

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[37] *Id.*
[38] *See id.*
[39] *Cf supra* note 34.
[40] *See, e.g.,* UGA CAES Cooperative Extension, Crop & Soil Scis., *A Guide to Corn Production in Georgia 2016*, at 100, 102, *available at* http://www.caes.uga.edu/commodities/fieldcrops/gagrains/documents/2016CornProductionGuide.pdf. This report expects a yield of 85 bushels of non-irrigated corn in south Georgia in 2016, compared to 200 bushels of irrigated corn. *Id.*

The improved technology has required a substantial investment. Retrofitting the old nozzles with improved drip nozzles, alone, had cost nearly $5,000.[41] *Like most of the farmers in the region, though, they readily embraced these conservation techniques. Stewardship is a core value of this farm and many others, and is a vital component of their success.*[42]

No one knows better than a farmer how precious water is as a resource. Water may be good insurance for a crop yield, but it is far from free; these farmers are incentivized not to use any more water than they must. Georgia farmers are engaged in constant discussions and self-education about conservation efforts.

Today's irrigation systems are highly efficient. The early high-pressure systems have been replaced by low-pressure ones. Dropped nozzles are now used to control and conserve the flow of water; "because they are closer to the plant canopy and operate at a lower water pressure, [they] reduce drift and deliver more water directly to the plant[s]."[43] Retrofitting a pivot's sprinklers with today's low-pressure sprinklers on drop hoses and installing end gun shut-offs can reduce water use by an average of twenty percent.[44]

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[41] The Flint River SWCD estimates the average cost to retrofit an older, high-pressure system with impact sprinklers to a system with more efficient, low-pressure sprinklers as between $3,000 and $5,000. The cost of some of the new conservation technologies is so high that policy experts have urged financial support to farmers because of the great public benefit of installing these tools. *See* Ga. Farm Bureau, *GFB hosts water tour for EPD Director Dunn*, *supra* note 14.

[42] "Farmers are stewards of the land, and their adoption of technology-driven conservation practices opens new opportunities for sustainable crop production." Flint River SWCD, *What We Do*, http://flintriverswcd.org/what-we-do/ (last visited Sept. 23, 2016).

[43] Ga. Farm Bureau, *GFB Water Committee gets update at SIRP* (Mar. 9, 2016), http://gfb.org/agnews/story.asp?RecordID=6029.

[44] Flint River Basin P'ship, *Agricultural Water Conservation in the Lower Flint River Basin of Georgia*, *available at* https://www.conservationgateway.org/Documents/AG%20Water%20Conservation%20-%20Lower%20Flint%20GA.pdf (last visited Oct. 7, 2016).

Southwest Georgia's farming communities are supported and assisted in their conservation efforts by Farm Bureau and impressive entities and facilities like the University of Georgia College of Agricultural and Environmental Sciences ("UGA CAES"),[45] the UGA CAES C.M. Stripling Irrigation Research Park ("SIRP"),[46] the Flint River Soil and Water Conservation District (the "Flint River SWCD"),[47] and the Georgia Water Planning and Policy Center,[48] to name a few. The Flint River SWCD, for example, "has managed multiple national and state grants and built transformative pilot projects to help farmers apply conservation practices on *more than 200,000 acres* of irrigated cropland in the Lower Flint River Basin" since 2000.[49]

Newer irrigation scheduling technology allows farmers to schedule irrigation events based on soil moisture – giving the crops exactly what they need, when they need it, and only as much as they need. One technique, advanced irrigation scheduling, uses "objective field data such as soil moisture, soil temperature, crop growth stage and localized evapotranspiration [ ] data"[50] to tell the farmers *when* to

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[45] *See generally* UGA CAES, http://www.caes.uga.edu/ (last visited Oct. 13, 2016).
[46] *See generally* C.M. Stripling Irrigation Research Park, http://striplingpark.org/ (last visited Oct. 13, 2016).
[47] *See generally* Flint River SWCD, http://flintriverswcd.org/ (last visited Oct. 13, 2016). The Flint River SWCD is comprised of "farmers, landowners, and community leaders that are dedicated to the conservation, wise use, and protection of natural resources in the Flint River Basin." Flint River SWCD, *Who We Are*, http://flintriverswcd.org/who-we-are/ (last visited Sept. 23, 2016); *see also* Flint River SWCD, *Education*, http://flintriverswcd.org/education/ (last visited Sept. 23, 2016) ("The Flint River Soil and Water Conservation District is dedicated to furthering conservation education efforts throughout southwest Georgia.").
[48] *See generally* Ga. Water Planning & Policy Center, http://www.h2opolicycenter.org/ (last visited Oct. 13, 2016).
[49] Flint River SWCD, *Projects*, http://flintriverswcd.org/projects/ (last visited Sept. 23, 2016) (emphasis added).
[50] *Agricultural Water Conservation*, *supra* note 3.

irrigate and estimates an amount of *how much* to irrigate.[51] Use of this technology has generated water savings of up to fifteen percent.[52]

Irrigation scheduling technology can also incorporate weather data to "calculate the amount of water that would be evaporated by a [ ] crop . . ., and then a crop coefficient is used to scale that reference value to a specific crop need." Recently, the Flint River SWCD led a collaboration with IBM "to evaluate the use of a precision weather forecasting model to advance irrigation scheduling in the Lower Flint River Basin."[53] These methods typically are based on a water balance method, based on the availability of water in the soil profile.[54] "Like a checkbook, inputs are credited to the total soil water, and withdrawals are debited from the soil water. The inputs to the soil water are rainfall and irrigation. Withdrawals include transpiration through the plant, evaporation from the soil surface, and deep percolation into lower soil layers."[55] Irrigation scheduling tools that combine water balancing with soil moisture monitoring "can prevent over-irrigating early in the crop season or under-watering later during peak crop water use."[56]

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[51] *See* UGA CAES Cooperative Extension, *2016 Georgia Cotton Production Guide*, at 73, *available at* http://www.ugacotton.com/vault/file/2016-UGA-Cotton-Production-Guide.pdf.
[52] *Agricultural Water Conservation*, *supra* note 3. The Flint River SWCD's recent "Low-Cost Irrigation Scheduling Technology Project" focused on "reduc[ing] the cost of advanced irrigation scheduling so that all producers can optimize irrigation decisions by using objective field data such as soil moisture, soil temperature, crop growth stage, and localized evapotranspiration." Flint River SWCD, *Projects*, *supra* note 49. "Utilizing [advanced irrigation scheduling] tools has produced water savings of up to 15%." Flint River SWCD, *Conservation Tools*, http://flintriverswcd.org/resources/ (last visited Sept. 23, 2016). "Savings are generated by identifying precise periods in time in which a farmer can reduce irrigation by using objective field data such as soil moisture, soil temperature, crop growth stage, and localized evapotranspiration." *Id.*
[53] Flint River SWCD, *Projects*, *supra* note 49.
[54] *Agricultural Water Conservation*, *supra* note 3.
[55] *Id.*
[56] *Agricultural Water Conservation*, *supra* note 3.

Farmers can now use technology to monitor the moisture of their soil ("remote soil moisture monitoring" or "RSMM").[57] These systems deploy probes or sensors to detect soil moisture conditions.[58] Amazingly, RSMM allows a farmer to detect plant stress even before it is visible or obvious, which can improve the quality of the plant and increase crop yields.[59] RSMM conserves water by allowing the farmer to avoid overwatering the plant.[60] Farmers can log in remotely and access real-time data from their RSMM technology, and make informed and conservative irrigation decisions based on that data.[61] Use of this technology is another investment by the farmers; a standard, commercially available soil moisture sensor or sensor network and monitoring system can range from $3,000-$5,000.[62]

John has no interest in using more water than his crops need – it doesn't help his costs, doesn't help his yield, and certainly won't help his children keep this farm going after he's gone. As a member of Farm Bureau's Water Advisory Committee, he continually discusses water withdrawal issues with other Georgia farmers. A few years back, he encouraged others to support the passage of the Georgia Water Stewardship Act, and traveled up to Atlanta to talk to legislators about key

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[57] *Id.* *See also* Flint River SWCD, *Projects*, *supra* note 49 (describing Remote Soil Moisture Monitoring Pilot Project launched in 2005, which "enable[d] each participating producer to make proactive irrigation decisions about when to irrigate and how much water to apply").
[58] *Agricultural Water Conservation*, *supra* note 3.
[59] *Id.*
[60] *Id.*
[61] *Id.*
[62] Costs are as estimated by the Flint River SWCD. *See also* Flint River SWCD, *Connecting the Farm with the Future of Agricultural Telemetry* (Aug. 3, 2016) ("The highest cost for a soil moisture sensor is related to the telemetry and transmission of the data to a server that allows the data to be accessed by the farmer or consultant.").

provisions related to agricultural withdrawal permits.[63] *In fact, every year since 1983, someone from his family has made a special trip to Atlanta for Farm Bureau's "Day at the Capitol," to meet with representatives in the General Assembly about legislative issues impacting their farm.*[64] *More than 500 of their fellow farmers join them at the annual event to play their part in the future of agriculture in Georgia.*[65]

The farmers, and Farm Bureau on their behalf, participated in the passage of state legislation imposing water metering requirements for farm water withdrawals.[66] More than 13,000 water meters have been installed to monitor agricultural water usage in Georgia.[67] By using water meters in conjunction with certain basic calculations, farmers can determine if they are applying the correct amount of water for their plants' needs and determine a water schedule for optimum productivity, while at the same time improving conservation efforts.[68] The meters provide previously-unavailable documentation of actual water use, and aid

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[63] Ga. Farm Bureau Fed'n Legis. Report (Feb. 19, 2010), at 2-3, *available at* http://www.gfb.org/legislative/ref/GFB_report_2-19-10.pdf.
[64] Ga. Farm Bureau, *Farmers' Voices Heard During GFB Day at the Capitol* (Feb. 10, 2016) http://www.gfb.org/agnews/story.asp?RecordID=5976.
[65] *See id.* (reporting that more than 500 Georgia Farm Bureau members traveled to Atlanta to participate in Farm Bureau Day at the Capitol).
[66] "In 2003 the Georgia General Assembly passed and Governor Sonny Perdue signed House Bill 579, requiring all permitted irrigation surface & groundwater withdrawals in Georgia to be metered by 2009." Georgia Soil & Water Conservation Commission [hereinafter GSWCC], *Soil & Water News* (Oct. 18, 2010), *available at* https://gaswcc.georgia.gov/sites/gaswcc.georgia.gov/files/Oct2010SoilWaterNews.pdf; *see also* H.B. 579 (eff. July 1, 2003), *available at* http://www.legis.ga.gov/Legislation/en-US/display/20032004/HB/579. The GSWCC has "the responsibility to install, read and maintain meters on and manage data from the irrigation systems that meet the conditions of HB579." Hawkins, *supra* note 5, at 1.
[67] GSWCC, *State Employees Reading Ag Irrigation Water Meters* (Dec. 17, 2014), *available at* http://www.gfb.org/agnews/story.asp?RecordID=5220.
[68] Hawkins, *supra* note 5.

farmers in managing water use.[69] Data gathered from the meters has shown Georgia farmers use *less* water than was once thought.[70] The farmers' cooperation in permitting third parties to install equipment and monitor conditions on their private property has been impressive, and evidences their desire to be a part of the State's broad conservation efforts.[71]

For certain crops, like cotton and corn, farmers may also practice a technique known as conservation tillage. This technique involves "using a cover crop and intentionally leaving plant residue from a prior crop in the field," which "modifies plant rooting structure and physiology to enable more efficient water use by crops."[72] As a result, the soil's water-holding capacity increases, as do water infiltration rates, while soil temperature, evaporative loss, and field runoff decrease.[73] Conservation tillage can optimize soil moisture to enhance crop growth in dry periods, and can reduce water use by up to 15%.[74]

Georgia's farmers are leaders in developing and adopting irrigation and water conservation technology on the farm. SIRP, which is operated by the University of Georgia CAES, is devoted to developing improved methods of water

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[69] *See* GSWCC, *State Employees Reading Ag Irrigation Water Meters*, *supra* note 67 ("Information from these meters assist policy makers in understanding agricultural water use in the state and help agricultural producers improve their water-use efficiency."); *see also id.* ("'The annual reading and maintenance process is a cornerstone of the Georgia Soil and Water Conservation Commission's agricultural water use program[.]'").
[70] Ga. Farm Bureau, *GFB hosts water tour for EPD Director Dunn*, *supra* note 14; *see also* Hawkins, *supra* note 5, at 1 ("Farmers are continually trying to manage their irrigation systems to increase yields and improve the quality of food and fiber. . . . [One of these methods, t]he agricultural water meter also can be used for improved yields while conserving water.").
[71] *See* GSWCC, *State Employees Reading Ag Irrigation Water Meters*, *supra* note 67 ("'We appreciate the cooperation of producers across the state and commend them for their water conservation efforts.").
[72] *Agricultural Water Conservation*, *supra* note 3.
[73] *Id.*
[74] *Id.*

application.[75] Techniques that are now more commonplace than they were fifteen years ago, like the use of deep wells and center pivot irrigation systems, resulted from SIRP's research.[76] SIRP's 130-acre facility studies the impacts of "irrigation scheduling, remote soil moisture monitoring, subsurface drip irrigation, variable rate irrigation and conservation tillage on water efficiency and crop yield."[77]

The farmers can now use Variable-Rate Irrigation ("VRI"), a "tool of precision agriculture that optimizes the placement of water application through irrigation management zones."[78] This technology "enables farmers to customize rates of irrigation water based on individual management zones within a field."[79] VRI can be used to eliminate water application over non-cropped areas of a field, saving both water and energy.[80] The University of Georgia Precision Agriculture team and the Flint River SWCD are now working on dynamic, or agronomic, VRI – the "next level" of VRI. "One approach for creating dynamic prescription maps is to use soil moisture sensors to estimate the amount of irrigation water needed to return each [irrigation management zone of a field] to an ideal soil moisture condition."[81]

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[75] Ga. Farm Bureau, *GFB Water Committee gets update at SIRP* (Mar. 9, 2016), http://gfb.org/agnews/story.asp?RecordID=6029.
[76] *Id.*
[77] Ga. Farm Bureau, *GFB hosts water tour for EPD Director Dunn*, *supra* note 14.
[78] Flint River SWCD, *Conservation Tools: Variable Rate Irrigation*, *supra* note 52. The Flint River SWCD has led multiple projects to develop VRI. Its pilot project deployed 22 VRI systems on approximately 3,500 acres of irrigated cropland in the Flint River Basin between 2005 and 2007. Flint River SWCD, *Projects*, *supra* note 49. More recently, the Flint River SWCD linked VRI with soil moisture monitoring on approximately 2,000 acres in the Flint River Basin, to develop "cost-effective tools" to "maximize irrigation efficiency and offset the impacts of low-flow conditions on aquatic-based ecosystems." *Id.*
[79] *Agricultural Water Conservation*, *supra* note 3.
[80] Flint River SWCD, *Conservation Tools: Variable Rate Irrigation*, *supra* note 52.
[81] Vellidis, George, *A Dynamic Variable Rate Irrigation System for Center Pivots* (2015), *available at* http://apps.caes.uga.edu/impactstatements/index.cfm?referenceInterface=IMPACT_STATEMENT&subInterface=detail_main&PK_ID=7159.

Georgia's farmers and researchers are indisputably on the cutting edge of developing these techniques.[82] Georgia is recognized as a global leader in agricultural water conservation and innovative irrigation technology.[83] The University of Georgia Precision Agriculture Team developed VRI for center pivots – something that is now widely offered by pivot manufacturers globally,[84] in new irrigation systems and as a retrofit on existing center pivot systems.[85] The same team also developed the University of Georgia Smart Sensor Array, "an inexpensive wireless soil moisture sensing system that allows for a high density of smart soil moisture sensors – a feature needed to enable dynamic prescription maps."[86] Some of the many benefits inured to the farmers who use VRI include reduced input costs, reduced runoff, more accurate water application, improved water use efficiency, and enhanced crop yields.[87]

Advances in crop management and conservation technology are continual. The "young star minds" of farming research in Georgia are "pushing the limits of

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[82] Oder, Tom, *Farming by the Numbers*, GEORGIA TREND (July 2016), available at http://www.georgiatrend.com/July-2016/Farming-by-the-Numbers/ ("When Georgia's farmers leave home in the morning, they carry the same tools to their jobs – smartphones, electronic tablets and laptops – as office workers in the state's urban centers. And when they head into the fields, the cabs of their tractors are equipped with technology – GPS and touchscreen computers that display field data and maps and send commands to regulate the flow of seed, fertilizer and more – that is on the cutting edge of modern farming.").

[83] *See* Pavey, Rob, *Georgia called irrigation leader at conservation forum*, THE AUGUSTA CHRONICLE (Oct. 18, 2012), *available at* http://chronicle.augusta.com/news/metro/2012-10-18/georgia-called-irrigation-leader-conservation-forum.

[84] Vellidis, *supra* note 81.

[85] *Agricultural Water Conservation*, *supra* note 3.

[86] *Id.*

[87] Flint River SWCD, *Conservation Tools: Variable Rate Irrigation*, *supra* note 52; *see also* Vellidis, *supra* note 81. ("[T]he [VRI] system has the potential to greatly increase agricultural water use efficiency and how much crop we get for every drop of irrigation water we apply. This technology may be a powerful tool for increasing agricultural productivity without increasing irrigation water demand."); *see also* Oder, *supra* note 82 (noting that, in addition to water savings, precision agriculture helps farmers make fields more uniform and identify problem areas, thereby increasing crop yield – in one instance, by an estimated 25-50 pounds per acre of cotton).

environmental and agricultural science to help Georgia farmers improve crop management," and working on the next, best techniques to introduce to the farms.[88]

B. The Broad Reach of Farming to Other Industries

Though John has seen vast improvements in his lifetime, he is confident that his son and daughter will bring even better ideas to the table after they graduate from college. His son, a junior at the UGA CAES, has focused his studies in the Department of Crop and Soil Sciences,[89] learning about tillage practices and other techniques, and studying under faculty on the UGA Peanut and Cotton Team.[90] Things like controlling irrigation from his laptop or smart phone aren't shocking to his son; they're the "new normal." His daughter, who is studying finance and wants to return to southwest Georgia, is planning an internship at one of Georgia's several agricultural lending institutions. John and Ann know that the farm will be in good hands, with the knowledge and commitment that his children will bring to farming in southwest Georgia in the years to come.

Irrigation has brought with it additional, related jobs and industries. Higher education certainly is one. The UGA CAES has seen enormous growth in student enrollment in the years since irrigation entered the playing field[91] and employs

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[88] Oder, *supra* note 82 (noting some of the "next-generation precision ag tools that are on the horizon," including: drones, robots, gas chromatograph, dynamic variable rate irrigation, adding fungicide and pesticide functions to center pivots, and three-in-one sensors).
[89] *See* UGA CAES, *Crop & Soil Sciences*, http://www.cropsoil.uga.edu/index.html (last visited Oct. 6, 2016).
[90] *See* UGA CAES, *Crop Management & Physiology*, http://www.cropsoil.uga.edu/research/physiology.html (last visited Oct. 6, 2016).
[91] *Compare* Fact Book 1970, Univ. of Ga., at 36, *available at* http://oir.uga.edu/eFactbook/1970/FactBook1970.pdf (noting UGA's agriculture school conferred a total of 246 degrees in 1970, and 2, 310 total degrees from 1961 through 1970); *with* UGA CAES,

nearly 3,000 individuals.[92] The CAES has three campuses and ten research and education facilities, and enrolled over 2,000 undergraduate and graduate students in the fall of 2015.[93] Abraham Baldwin Agricultural College ("ABAC"), which is located in southwest Georgia maintains a School of Agriculture and Natural Resources,[94] enrolls over 3,400 students[95] and recently saw four consecutive semesters of enrollment increases.[96] The Water Planning and Policy Center at Albany State University, also located in southwest Georgia, leads projects aimed at increasing on-farm water conservation, has an economic impact of $141 million on the Albany, Georgia region in the region.[97]

The farming-related higher education industry is vital to the state's, and in particular southwest Georgia's, economic success. ABAC, for example, generated a total economic impact on south Georgia of over $329 million during the 2014 fiscal year.[98] These institutions have an enormous impact on the state's economy, prepare future farmers to achieve increased productivity, and provide necessary research

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CAES Quick Facts, http://www.caes.uga.edu/about/quickfacts.html (last visited Oct. 5, 2016) (reporting total student enrollment in CAES for fall semester 2015 as 2,020).

[92] *CAES Quick Facts*, *supra* note 91.

[93] *Id.*

[94] The School of Agriculture and Natural Resources at Abraham Baldwin Agricultural College prepares students to enter the agricultural sector with expertise in crop production, ag business, livestock production, education, and crop and soil science. Abraham Baldwin Agric. Coll. [hereinafter "ABAC], Sch. of Agric. & Natural Res., *Agriculture*, http://www.abac.edu/academics/schools/ag-natural-resources/agriculture (last visited Sept. 28, 2016).

[95] ABAC, *ABAC Economic Impact Over $260 Million*, http://www.abac.edu/current-news/2013/abac-economic-impact-over-260-million (last visited Sept. 28, 2016).

[96] *Id.*

[97] Ctr. for Behavioral & Experimental Agri-Environmental Research, *Mark Masters & ASU become research leaders in Southwest Georgia*, http://centerbear.org/mark-masters-asu-research-leaders/ (last visited Oct. 7, 2016).

[98] ABAC, *ABAC Economic Impact on South Georgia Reaches $329,844,725* (Apr. 14, 2016), http://www.abac.edu/current-news/2016/abac-economic-impact-on-south-georgia-reaches-329844725 (last visited Sept. 28, 2016).

and support for advancements in modern irrigation and agriculture.[99] The UGA CAES recently "broke records . . . with $69 million in external funding" for projects at research plots and state-of-the-art laboratories across Georgia, to in turn "support Georgia's $74.3 billion agricultural industry and improve the food security and health of people around the world."[100] The increase in research funding to UGA CAES included "a significant increase in funding from the National Science Foundation, highlighting UGA's strength in plant research."[101] This research directly improves the productivity and efficiency of Georgia's farms.

Lending is another industry supported by irrigation. Commercial lenders' financial performance would inevitably be impacted by lower crop yields due to unavailability of irrigation.[102] Row crops constitute a significant portion of the commodities produced by their borrowers, and repayment ability is, of course, related to those crops' yields.[103]

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[99] *See* Ga. Farm Bureau, *Ga Farm Bureau President Testifies at Farm Bill Hearing: GFB Peanut Committee member Andy Bell testifies regarding crop insurance* (May 17, 2010), *http://www.gfb.org/releases/pr_fbhearing_051710.html* (May 17, 2010) (quoting then-President of GFB, Zippy Duvall, as testifying on the "need to [ ] encourage young people graduating from our agriculture schools to return to the land. If we don't succeed in getting them to return to the farm and engage in production agriculture we will lose agriculture.").

[100] Univ. of Ga., Griffin Campus, *Spotlight on Research: Researchers with the UGA CAES brought in $69 million in external funding during fiscal year 2016* (Aug. 11, 2016), http://www.griffin.uga.edu/; *see also id.* ("In fiscal year 2016, research expenditures at UGA increased by 14 percent to reach $175.3 million. . . . 'As the university's research productivity continues to increase, so does our ability to make a positive impact on our state, nation and world,' said UGA President Jere W. Morehead.").

[101] *Id.*

[102] *See* AgSouth Farm Credit, ACA, *2015 Annual Report*, at 5, *available at* https://www.agsouthfc.com/agsouth/files/6a/6ab9117a-863b-46d9-a540-94405d4770fc.pdf (noting that lender's "financial performance and credit quality measures would likely be negatively impacted" by "less favorable economic conditions in agriculture, including extensive and extended drought conditions").

[103] *See id.* at 8 ("Repayment ability is closely related to the commodities produced by our borrowers . . . ."); *id.* (listing predominant commodities in loan portfolio, including, among other things, soybeans, hay, cotton, and nuts).

Row crops, in particular, create more jobs in the farming process due to their intensive nature, and still more jobs in processing, sales, transport, and beyond.[104] Farming is a boon to southwest Georgia local economies.

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As it nears 8:00 a.m., the temperature is already in the low 80s. The high will be 100 degrees or greater again today. He checked the moisture readings last night and again this morning. Without rain this afternoon, he will have to start the irrigation system this evening.

He does not make the decision lightly to start the irrigation system. His electricity bill each summer month has been thousands of dollars. Even with the increased usage of solar panels, the electric bills have been high.

The hoped-for afternoon rains do not arrive. John heads out to the fields at about 7:30 p.m. to start the irrigation system. He carefully monitors the water usage. The irrigation system is twenty to thirty percent more efficient than that first system his grandfather installed.

The stress on the crops from the 100-degree heat is obvious. But the plants will look better in the morning, and this watering should hold for a few days. His grandfather would not have had this option. Despite the hot, dry summer, he knows

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[104] *See, e.g.,* Fargo, Charlyn, *Cotton Takes Top Spot in Georgia Row Crops*, FARM FLAVOR (Oct. 8, 2012), *available at* http://www.farmflavor.com/georgia/georgia-ag-products/cotton-takes-top-spot-in-georgia-row-crops/ ("Because cotton is a highly intensive crop, it's very good for the local economies. Cotton creates more jobs – from the gin to the warehouse to the shops – than any other crop." (quotation marks omitted)).

they will make a crop. Irrigation has been invaluable to the farms of southwest Georgia, where summer temperatures are high and the soils are sandier.[105]

John's family is gratified knowing that the food and fiber being produced on this farm, and his neighbors' farms, will make its way around the country, and even the world. This farm helps to feed hungry children in all the counties around him;[106] *he and the rest of Georgia's farmers donate more than 10 million pounds of fresh produce to Georgia food banks and help feed more than 1.9 million Georgians through donations alone.*[107] *He and his neighbors' annual cotton production clothe hundreds of millions of people all over the world.*[108]

John and his family don't take this most precious resource lightly, or their responsibilities to future Georgians. Next month, they'll be teaching elementary school students about water conservation at the Annual Regional Water Festival in southwest Georgia, which they helped to plan.[109]

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[105] *See 2016 Georgia Cotton Production Guide*, *supra* note 51, at 69 ("Irrigation is particularly important in areas that frequently have drought in July through August and on sandy soils.").
[106] *See, e.g.,* Baggett, Lauren, *Manna Drop helps fight hunger in Southwest Georgia*, ALBANY HERALD (Apr. 17, 2016), *available at* http://www.albanyherald.com/news/local/manna-drop-helps-fight-hunger-in-southwest-georgia/article_05701332-ca6d-5079-a4bc-1f0c0493f035.html ("According to Feeding America, food insecurity is worse in mainly rural Southwest Georgia than in most other parts of the state.").
[107] *See* Georgia Food Bank Ass'n*, Georgia farmers feeding Georgia families*, http://georgiafoodbankassociation.org/make-a-difference/campaigns/farm-to-food-bank/ (last visited Oct. 11, 2016).
[108] *See 2016 Ag Snapshots*, *supra* note 18, at 12 ("You could make 516 million pairs of blue jeans from Georgia's annual cotton production."); *see also* Fargo, *supra* note 104 ("Love those blue jeans? You have a cotton farmer to thank. Georgia cotton farmers produce 2.2 million bales of cotton every year, enough to rank cotton as the number-two commodity in the state. And as for those favorite jeans, it takes 24 ounces of cotton to make one pair.").
[109] *See* Parks, Jennifer, *Annual Regional Water Festival wraps up 13th year: Hundreds of elementary school students learn about water conservation at festival*, ALBANY HERALD (Sep. 29, 2016), *available at* http://www.albanyherald.com/news/local/annual-regional-water-festival-wraps-up-th-year/article_cbc535fb-2f20-5b7e-b907-ad26225cbbbc.html; *see also* Patterson, Catherine, *Students learn to appreciate H2O during Water Festival*, WALB NEWS (Sept. 27, 2016), http://www.walb.com/story/33262546/students-learn-to-appreciate-h2o-during-water-festival

John and his family are glad that their investments will ensure that this farm will continue to produce for generations to come.

V. Conclusion

Irrigation is the best risk management tool in southwest Georgia. The variety of crops grown in the region develop differently, and require water at different times. Irrigation, of course, is not free; it is an investment that the farmers do not take lightly.

"Timely access to water is an *absolute necessity* for survival of agriculture in Georgia."[110] Drastically reducing or eliminating the water available for irrigation in southwest Georgia would have far-reaching consequences. This entire region's way of life and economic foundation cannot be overlooked in considering equitable apportionment schemes. There is no large metropolitan area in southwest Georgia that could offset economic losses to agriculture caused by reduction or elimination of irrigation. Rural communities in southwest Georgia will be deprived of their lifeblood, families will be deprived of their livelihoods, and future generations of opportunity will be impossible.

Georgia Farm Bureau Federation therefore respectfully submits this brief, as *amicus curiae*, for the Special Master's consideration.

(reporting on three-day Water Festival sponsored by Keep Albany-Dougherty Beautiful and the Albany State University Georgia Water Planning and Policy Center, in which "800 students will participate").

[110] Ga. Farm Bureau, *Regional Water Councils*, *supra* note 28.

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STATE OF FLORIDA,

Plaintiff,

v.

STATE OF GEORGIA,

Defendant

Before the Special Master

Hon. Ralph I. Lancaster

CERTIFICATE OF SERVICE

This is to certify that the Brief of *Amicus Curiae* Georgia Farm Bureau Federation has been served on this 21st day of October, 2016, in the manner specified below:

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