No. 143, Original

IN THE Supreme Court of the United States

STATE OF MISSISSIPPI,

Plaintiff,

V.

STATE OF TENNESSEE, CITY OF MEMPHIS, TENNESSEE AND MEMPHIS LIGHT, GAS & WATER DIVISION,

Defendants.

On Bill of Complaint Before the Special Master, Hon. Eugene E. Siler, Jr.

PLAINTIFF'S MOTION TO EXCLUDE DEFENDANTS' EXPERTS

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Counsel for the State of Mississippi

I. INTRODUCTION

The Special Master ordered that "an evidentiary hearing should be held on the limited issue of whether *the water that is at issue* in this case is interstate in nature." Dkt. No. 56, 8/12/16 Case Management Order at 1 (emphasis added). This Order crystalized the discussion in the Memorandum of Decision of the same date stating that whether the *water at issue* is or is not a shared interstate resource is the controlling legal issue. *Id.* at 36. The Court's Order suggested some types of evidence for the hearing, including the nature and extent of hydrological and geological connections, historical groundwater flows between the states, and similar considerations, but it never invited expert opinions on the dispositive issue identified by the Special Master for a full evidentiary hearing. *Id.*

The stated purpose of the evidentiary hearing is to take evidence of the geological and hydrological facts necessary to make this legal determination. Nevertheless, the expert reports requested and provided by Defendants reveal that each of the Defendants' experts was retained for the express purpose of offering an opinion that the naturally occurring deep groundwater at issue is an interstate resource. *See, e.g.*, Dkt. No. 70 at 29-35, Defs.' Mot. for Summ. J. (Defendants' expert report describing the Aquifer as "an interstate water resource").¹

¹ Defendants' experts consistently conflate complex geology with any and all groundwater that might be found within deep discontinuous formations under approximately 90,000 square miles of earth laid down as river and ocean sediments during hundreds of millions of years of earth history.

This Court should exclude the testimony of Defendants' experts because the opinion they were specifically retained to offer is a legal issue and conclusion falling outside the realm of expert witness testimony, as both this Court and Defendants have previously recognized.²

II. <u>DEFENDANTS' EXPERTS' OPINIONS</u>

Collectively, the Defendants have hired and tendered three witnesses through whom they intend to provide definitions of "interstate aquifer" or "interstate resource" and to offer the opinion that all groundwater beneath the Mississippi Embayment underlying parts of eight states is interstate water: David Langseth, Brian Waldron, and Steven Larson.

A. Memphis' Expert David Langseth

David Langseth's Report specifically states that he was retained "to opine on whether the aquifer known in Tennessee as the Memphis Sand Aquifer and known in Mississippi as the Sparta Sand Aquifer, and the groundwater in it . . . constitutes an interstate aquifer." Ex. 1, 6/27/17 Langseth Report Excerpt at 1. To this end (using his own definition of "interstate aquifer"),³ Langseth opines that "the aquifer"

² Some limited portions of the reports and/or deposition testimony of Mississippi's experts contain personal opinions of what constitutes "interstate" or "intrastate" groundwater; however, Mississippi will not elicit or offer any such opinions.

³ Langseth's Report states that "if a state line crosses over some portion of an aquifer, that aquifer is an interstate aquifer." Ex. 1 at 15.

as Defendants define it—not the groundwater actually at issue—is "an interstate aquifer." Id. at 15.

B. Tennessee's Expert Brian Waldron

Tennessee hired Brian Waldron to offer an opinion on the question of "whether the Middle Claiborne aquifer is an interstate water resource." Ex. 2, 6/30/17 Waldron Report Excerpt at 1; *see also id.* at 2 ("The central question that I have been asked to give my opinion about is whether the groundwater in the Middle Claiborne aquifer is an 'interstate resource."). Waldron's opinion is that "[t]he water in the aquifer is an interstate resource." *Id.* at 2.⁴

C. Tennessee's Expert Steven Larson

Tennessee also retained Steven Larson for the specific purpose of offering his opinion as to "whether the Aquifer is an interstate resource." Ex. 4, 6/30/17 Larson Report Excerpt at 1. Mr. Larson concludes that "the groundwater of the Middle Claiborne aquifer is an interstate water resource." *Id.* at 2.⁵

⁴ Like Langseth, Waldron's report ignores the groundwater at issue in this original action and opines that "the aquifer" as Defendants define it, is interstate in nature because it crosses state lines, and groundwater constantly moves. *See* Ex. 3, 5/30/07 Waldron Dep. Tr. Excerpt at 89 (defining "interstate aquifer" as one where "the geology and the hydrology crosses state lines").

⁵ During his deposition, Mr. Larson testified that the basis for his conclusion "is that the aquifer and the water in it spans several states and that activities in one state can affect conditions in the other state or another state." Ex. 5, 5/30/17 Larson Dep. Tr. Excerpt at 101-02.

III. LEGAL STANDARD

Testimony offering legal conclusions (as opposed to testimony regarding facts in contention) is <u>not</u> substantive evidence that can be offered to support the Court's determination of the law. *See Shahid v. City of Detroit*, 889 F.2d 1543, 1547 (6th Cir. 1989) (holding that expert testimony was not admissible on ultimate legal conclusion of whether correctional officers were negligent in failing to provide necessary medical treatment to inmate). As such, legal conclusions are inadmissible. *Id.* ⁶

While Fed. R. Evid. 704 permits expert testimony that embraces an ultimate issue, it is well established that the role of expert witnesses does not extend to legal conclusions, which are solely within the province of the court. *See United States v. Williams*, 343 F.3d 423, 435 (5th Cir. 2003); *United States v. McGee*, 821 F.3d 644, 648-49 (5th Cir. 2016), *cert denied*, 137 S. Ct. 251 (2016);⁷ see also Advisory Committee Notes to Fed. R. Evid. 704; *United States v. Scop*, 846 F.2d 135, 139 (2d

⁶ See also Specht v. Jensen, 853 F.2d 805, 808-09 (10th Cir. 1988) (holding that allowing expert to testify as to whether there had been a "search" in plaintiff's residence constituted reversible error; summarizing cases in which the Second, Fourth, Fifth, and Sixth Circuits held that expert witnesses may not give legal conclusions); *Hogan v. Am. Tel. & Tel. Co.*, 812 F.2d 409 (8th Cir. 1987) ("Opinion testimony is not helpful to the factfinder if it is couched as a legal conclusion.").

⁷ A legal conclusion is anything that may implicitly provide a legal standard to the trier of fact. *See In re Air Disaster at Lockerbie Scotland on Dec. 21, 1988*, 37 F.3d 804, 827 (2d Cir. 1994); *Burkhart v. Washington Metro. Area Transit Auth.*, 112 F.3d 1207, 1212 (D.C. Cir. 1997) (defining a legal conclusion as use of language that tracks the law, or where terms are used that have a specialized legal meaning that is more precise than the lay understanding of the terms).

Cir. 1988) ("Rule 704 was not intended to allow experts to offer opinions embodying legal conclusions."); *DeMerrell v. City of Cheboygan*, 206 F. App'x 418 (6th Cir. 2006) (affirming exclusion of expert testimony that merely expressed a legal conclusion (citing *Berry v. City of Detroit*, 25 F.3d 1342 (6th Cir. 1994)).

Federal courts routinely hold that "legal conclusions are insufficient to 'set forth facts." *Cobin v. Rice*, 823 F. Supp. 1419, 1433 (N.D. Ind. 1993) (citation omitted); *see also Flintkote Co. v. Gen. Acc. Assur. Co.*, 410 F. Supp. 2d 875, 885 (N.D. Cal. 2006) ("The court agrees that these statements have no significance and will disregard them."); *Lederman v. Pacific Indus., Inc.*, 939 F. Supp. 619, 622 (N.D. Ill. 1996) ("These legal conclusions are improper and are stricken."), *aff'd*, 119 F.3d 551 (7th Cir. 1997). Thus, testimony as to legal conclusions going to the outcome of the case is inadmissible. *Good Shepherd Manor Found., Inc. v. City of Momence*, 323 F.3d 557, 564 (7th Cir. 2003); *Woods v. Lecureux*, 110 F.3d 1215, 1220 (6th Cir. 1997) (noting that expert testimony consisting of legal conclusions is inadmissible).

IV. ARGUMENT

One prefatory clarification relating to Defendants' expert opinions is appropriate. Defendants' experts use an abundance of broad statements and qualifiers to support these opinions. For example, they state that groundwater beneath Mississippi "will ultimately leave the state;" "will not permanently remain;"

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is not "static;" is "moving;" etc. Such broad statements are misleading because Defendants' experts uniformly ignore certain material hydrological facts, including groundwater residence time under natural conditions. For example, while the groundwater at issue certainly moves, under natural conditions such movement east to west across DeSoto County, Mississippi, is estimated to take between 3,800 and 22,000 years. *See* Ex. 6, 8/31/17 Wiley Rebuttal Report Excerpt, Figure 1. Even Tennessee's expert Brian Waldron testified that the average age of groundwater being withdrawn by Memphis Light Gas & Water is 2,000 to 3,000 years, but that he did not consider groundwater residence time at all in formulating his opinions. Ex. 3, 5/30/17 Waldron Dep. Tr. at 65-68, 90.

A. The Court Has Already Concluded That Whether The Water At Issue In This Dispute Is or Is Not Interstate In Nature Is A Legal Conclusion To Be Decided By The Court After Development Of A Full Factual Record

The August 12, 2016, Order segmented the proceedings in this original action, finding that "an evidentiary hearing should be held on the limited issue of whether the water that is at issue in this case is interstate in nature." Dkt. No. 56, 8/12/16 Case Management Order at 1. The Order embodied the conclusion of the discussion in the Memorandum of Decision in which this Court expressly concluded that whether the water at issue is intrastate or interstate is a legal conclusion. Dkt. No. 55, Mem. of Decision at 25. Not only is this a legal conclusion, it is "the threshold issue." *Id.* at 36. For these reasons, the Court ordered an evidentiary hearing to

develop a full record of the facts necessary to make this determination, and also provided an illustration of potential categories of factual evidence that may be offered for this purpose. *Id.* While these facts will necessarily be offered by learned professionals in their relevant specialized fields, the determination of the legal rights and responsibilities under the Constitution of the United States as they may flow from the threshold issue as defined is a pure question of law. The Court should therefore exclude any opinion testimony directly addressing this issue during the January 2019 evidentiary hearing.

B. The Defendants Posed This Legal Question To Their Own Experts And Should Be Estopped From Asserting Any Right To Proffer Such Testimony

 (objections by Defendants to descriptions of groundwater at issue as "intrastate" "because it is a legal conclusion").

These specific arguments by Defendants in this original action before the Court have been followed by Defendants' specific instructions to their expert witnesses to riddle those expert reports and their deposition testimony with legal opinions. Having built their defense for the upcoming evidentiary hearing against this background, Defendants cannot claim surprise that all such opinions will be excluded during the evidentiary hearing, and this provides an additional ground for granting Mississippi's Motion to Exclude.

V. <u>CONCLUSION</u>

For the reasons explained above, Plaintiff respectfully requests that the Court grant this Motion and enter an Order excluding Defendants' experts.

Dated: November 1, 2018 Respectfully submitted,

THE STATE OF MISSISSIPPI

<u>/s/ C. Michael Ellingburg</u> C. Michael Ellingburg

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CERTIFICATE OF SERVICE

Pursuant to Paragraph 3 of the Special Master's Case Management Plan (Dkt.

No. 57), I hereby certify that all parties on the Special Master's approved service list

(Dkt. No. 26) have been served by electronic mail, this the 1st day of November,

2018.

<u>/s/ C. Michael Ellingburg</u> C. Michael Ellingburg

Counsel for Plaintiff

Expert Report on the Interstate Nature of the Memphis/Sparta Sand Aquifer

Volume 1 of 2: Report Text

Submitted on behalf of the City of Memphis, Tennessee, and Memphis Light, Gas & Water Division

in the matter of

State of Mississippi v. State of Tennessee, City of Memphis, Tennessee, and Memphis Light, Gas & Water Division

Supreme Court of the United States of America, No. 143 Orig.

Prepared by

DE Langeth

David E. Langseth, Sc.D., P.E., D. WRE

Prepared for Baker, Donelson, Bearman, Caldwell & Berkowitz, PC First Tennessee Building 165 Madison Ave., Suite 2000 Memphis, TN 38103



www.gradientcorp.com 20 University Road Cambridge, MA 02138 617-395-5000

June 27, 2017

1.1 Scope and Approach

I have been retained by the law firm of Baker, Donelson, Bearman, Caldwell & Berkowitz, PC, which represents the Defendants Memphis Light, Gas & Water Division (MLGW) and the City of Memphis, Tennessee, to opine on whether the aquifer known in Tennessee as the Memphis Sand Aquifer and known in Mississippi as the Sparta Sand Aquifer, and the groundwater in it, (hereafter referred to as the "MSSA") constitutes an interstate aquifer.¹ This specific question has arisen in the context of the matter of *State of Mississippi v. State of Tennessee, et al.*, No. 143 Original (US Supreme Court, 2014).

In preparing this Report, I have relied on my education, training, experience, and various documents that I have reviewed, including: the Complaint (Mississippi, Attorney General, 2014); the August 12, 2016, Memorandum of Decision (Judge Eugene Siler Jr., Special Master, 2016); various other legal pleadings related to the Complaint; publicly available data and reports, including simulation models described in various reports for the aquifers in the Mississippi Embayment Aquifer System, focusing on the northern Mississippi and western Tennessee area; and literature in the fields of hydrology, geology, and hydrogeology.² Additionally, for reasons not related to this case, I have personally visited MSSA outcrop zones on both the eastern (April 3, 2008) and western (January 12, 2013) sides of the Mississippi Embayment Aquifer System and have reviewed some of the available boring logs for the Mississippi Embayment area. This Report is grounded in site-specific data and analysis. The methods that I used to form the opinions expressed in this Report are well established and accepted in the disciplines of hydrology, geology, and hydrogeology, and I have applied those methods in a manner consistent with the common standards of those disciplines. Sources upon which I specifically relied are cited in this Report and listed in the references section. I have not cited to general literature that informs my overall expertise in the subject matter.

¹ In order for a geologic formation to be considered an "aquifer," it must both contain water and the water must move with sufficient ease within that geologic formation to supply useable amounts of water to wells (see definition in Section 1.5). The term "aquifer" therefore refers simultaneously to both the geologic formation and the water contained therein.

 $^{^2}$ For purposes of this Report, the field of hydrogeology may be considered the intersection of the fields of hydrology and geology. Hydrology deals with the occurrence and movement of water. Geology deals with the nature of the mineral matter below the ground surface. Hydrogeology deals with the occurrence and movement of water below the ground surface. Each of these fields may also be construed more broadly.

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My opinion is that the aquifer that is the subject of this case, the MSSA, including the groundwater in it, is an interstate aquifer. The MSSA, known in Tennessee as the Memphis Sand Aquifer and in Mississippi as the Sparta Sand Aquifer, lies beneath several states and is a vital source of water for the states overlying it. Before pumping began, groundwater in the MSSA naturally flowed from Mississippi into Tennessee, from Tennessee into Mississippi, and from both those states into Arkansas. Pumping from the MSSA in one state can impact the flow direction and potentiometric head of the MSSA in other states. The MSSA is hydrologically connected to other interstate aquifers and to interstate streams in the Mississippi Embayment. Factual and scientific support for these and other concepts that support my opinion are discussed in this Section and supported by other information set forth in the entirety of this Report.

3.1 The MSSA is physically located beneath several states, including Mississippi and Tennessee, and is a resource that is shared by and common to the states that overlie it.

Based on the use of the term "interstate aquifer" in scientific literature¹³ and the common meaning of the word "interstate,"¹⁴ if some portion of an aquifer is beneath one state and another portion is beneath another state, that aquifer is an interstate aquifer. Said differently, if a state line crosses over some portion of an aquifer, that aquifer is an interstate aquifer. That is the case with the MSSA, and hence, the MSSA is an interstate aquifer.

The MSSA is physically located beneath several states, including Mississippi, Tennessee, Arkansas, Louisiana, Kentucky, and Missouri (see Figure 2.2.1c and Schrader, 2008), and groundwater is laterally continuous throughout the MSSA, including locations where state lines cross over the MSSA. As discussed in Section 2.3, this has been known for over a hundred years.

The MSSA's groundwater is shared by the states overlying the resource. For example, in western Tennessee, the MSSA is the principal source of drinking water (Brahana and Broshears, 2001, p. 2). In northern Mississippi, the MSSA is also the primary source of public drinking water and is increasingly used for agriculture (Newcome, 1976, Plate 1; Wasson, 1986, p. 50; McKee and Hays, 2002, p. 1). In east-central and southern Arkansas and northern Louisiana, the MSSA is used for drinking water, industrial, and agricultural purposes (Burns & McDonnell, Inc., 2007,

¹³ See, for example, "Interstate and International Aquifers," (Bittinger and Jones, 1972). In the first paragraph of the article, the authors note that "State and national boundaries are traversed by natural surface water and groundwater systems. The flow of water in such systems is not at all influenced by these boundaries. The quantity or quality of the water flowing in these systems, however, may be materially influenced by man's activities on one or both sides of the boundary."

¹⁴ *The American Heritage College Dictionary* (1997), Third Edition, defines "interstate" as: "Involving, existing between, or connecting two or more states."

GRADIENT

Expert Report of Brian Waldron, Ph.D.

Prepared on Behalf of the State of Tennessee In the Matter of *Mississippi v. Tennessee et al.*, No. 143, Original (U.S.)

June 30, 2017

Signed: 3

Brian Waldron, Ph.D.

SECTION 1. Qualifications and Background

1. I am currently an Associate Professor in the Department of Civil Engineering at the University of Memphis. My research focuses on groundwater, including numerical modeling of groundwater flow. I am also the Director of the Center for Applied Earth Science and Engineering Research at the University of Memphis, an interdisciplinary research center that combines the resources of two previous University of Memphis research centers, the Center for Partnerships in GIS and the Ground Water Institute. I previously served as interim director of the Ground Water Institute and director of the Center for Partnerships in GIS.

2. I obtained my B.A. and M.A. in Civil Engineering from the University of Memphis (formerly known as Memphis State University) and my Ph.D. in Civil Engineering from Colorado State University. I have published articles in a variety of peer-reviewed journals, including specifically about groundwater modeling and the Middle Claiborne aquifer. My full CV is attached as Appendix A to this report, and it includes all of my publications from the last ten years. I have not testified as an expert in any proceeding in the past four years.

3. I prepared this report at the request of the State of Tennessee for use in the original Supreme Court proceeding, *Mississippi v. Tennessee et al.*, No. 143, Original (U.S.). Specifically, I have been asked to opine on the question that I understand is at issue at this stage of the proceedings, which is whether the Middle Claiborne aquifer is an interstate water resource. My opinions are based on my training as an engineer specializing in the study of groundwater and on the sources and data identified in this report. I reserve the right to revise or amend this report as necessary based on new information that may become available.

4. I am not being compensated for my expert services in this proceeding other than my ordinary compensation for my full-time positions at the University of Memphis. My compensation does not depend in any way on my opinions or on the outcome of this proceeding. The Office of the Tennessee Attorney General has an agreement to compensate the University of Memphis for my time at the rate of \$275 per hour, in addition to paying the University for reasonable expenses I incur that are related to serving as an expert.

SECTION 2. Summary of opinions

5. The central question that I have been asked to give my opinion about is whether the groundwater in the Middle Claiborne aquifer is an "interstate resource."

6. The Middle Claiborne aquifer is part of a larger set of aquifers within the regional geologic framework, the Mississippi embayment, which underlies portions of the states of Louisiana, Mississippi, Tennessee, Arkansas, Alabama, Kentucky, Illinois, and Missouri. Naming conventions of the aquifers change as they cross state boundaries and as the formations split, merge, or otherwise change over distance. Waldron et al. (2011) detailed these naming convention changes and correlated geologic formations across state boundaries. In Shelby County, Tennessee, the Middle Claiborne is locally named the Memphis Sand. In DeSoto County, Mississippi, the Middle Claiborne is locally named the Sparta Sand. The Middle Claiborne aquifer will be the geologic name applied in this report to represent the Memphis aquifer and the Sparta aquifer.

7. I understand that Mississippi asserts that a certain portion of the groundwater within the Middle Claiborne aquifer under Mississippi constitutes an "intrastate" resource because it allegedly would remain confined within the state boundaries under natural conditions, because it allegedly crosses into Tennessee only because of pumping, and because it would not otherwise flow across the Mississippi-Tennessee boundary. These assertions are not supported by the scientific consensus about the nature of the aquifer generally or by any valid analysis of groundwater flow in the aquifer.

8. The water in the aquifer is an interstate resource. I base this conclusion on two opinions, as described below.

Opinion 1: The Middle Claiborne aquifer extends continuously underneath Tennessee and Mississippi, and groundwater in the aquifer is not and has never been "confined" to the borders of Mississippi or any other state.

9. There is a scientific consensus that the "Memphis aquifer" and the "Sparta aquifer" are parts of one aquifer, a single hydrological unit referred to as the Middle Claiborne aquifer. The Middle Claiborne aquifer extends, continuously and without meaningful change that would prevent groundwater flow from one part to another, under Mississippi, Tennessee, and Arkansas, as well as other states. There are no physical or hydrological barriers that separate the portions of the aquifer within Mississippi from other parts of the same aquifer at the Tennessee-Mississippi-Arkansas state lines, and groundwater naturally can and does move freely across political boundaries within the aquifer.

10. The term "confined" as used in Mississippi's assertions differs in meaning from the same term used in basic hydrology when characterizing an aquifer as confined or unconfined. A confined aquifer is vertically bounded above and below by a less permeable layer such as clay that pressurizes the groundwater. As a result, when a well is emplaced into a confined aquifer, the static water level in the well rises above the basal elevation of the upper impermeable (or confining) layer. An unconfined aquifer is not under pressure, and the static water level in a well rises to the elevation of the water table.

In the Matter Of:

STATE OF MISSISSIPPI vs CITY OF MEMPHIS

BRIAN WALDRON

September 27, 2017



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Confidential Brian Waldron - September 27, 2017

	6	2	63
1	A. No.	1	A. Some of that information, yes.
2	Q. Okay. I mean, it's hard to calculate and	2	Q. And then you would what other
3	determine, isn't it?	3	information
4	A. It's complex.	4	MR. LEO BEARMAN: Speak up, please.
5	Q. It's complex. And to do it accurately	5	Q. What other information would you need
6	requires a lot of actual well data that is planned	6	MR. LEO BEARMAN: Both of y'all.
7	and obtained pursuant to that plan, doesn't it?	7	MR. ELLINGBURG: Yes, sir. Yes, sir.
8	A. Correct.	8	MR. LEO BEARMAN: Thank you.
9	Q. Well, what is it that you would need in	9	BY MR. ELLINGBURG:
10	the state of Tennessee where you work and have	10	Q. What other information would you need to
11	been working for years to do an accurate	11	perform that characterization of the aquifer?
12	evaluation of the recharge taking place in	12	A. Those are the primary the ones that I
13	Tennessee and to the Middle Claiborne Aquifer?	13	listed are the primary.
14	A. You would use a suite of tools to estimate	14	Q. When you're talking about wells, you're
15	recharge potential.	15	talking about wells that are planned and placed
16	Q. And what would those tools be?	16	and screened and data is collected for the
17	A. Wells, precipitation, water balance, soil	17	specific purpose of understanding what is going on
18	moisture profiles.	18	in the outcrop area; is that correct?
19	Q. Anything else?	19	A. Yes, sir.
20	A. You would do characterization of the	20	Q. And you don't have that for Tennessee and
21	aquifer.	21	you certainly don't have it for Mississippi?
22	Q. A what?	22	A. For what time frame?
23	A. Characterization of the aquifer.	23	Q. Do you have it now for Mississippi or for
24	Q. That's something that you would perform	24	Tennessee in the outcrop area?
25	based on all that information?	25	A. We do not have it for Mississippi. We
1	6 have some data on Dinegrest Presbuterian Camp	4	65
1	6 have some data on Pinecrest Presbyterian Camp.	4 1	65 to look more specifically in Jackson where that alignment is
1 2 3	6 have some data on Pinecrest Presbyterian Camp. Q. Right. That was the purpose of the three wells at Pinecrest?	4 1 2 3	65 to look more specifically in Jackson where that alignment is.
1 2 3 4	6 have some data on Pinecrest Presbyterian Camp. Q. Right. That was the purpose of the three wells at Pinecrest?	4 1 2 3 4	65 to look more specifically in Jackson where that alignment is. Q. Okay. And any other locations where you have that information?
1 2 3 4	6 have some data on Pinecrest Presbyterian Camp. Q. Right. That was the purpose of the three wells at Pinecrest? A. Yes, sir. Q. But that's the only location you have	4 1 2 3 4 5	65 to look more specifically in Jackson where that alignment is. Q. Okay. And any other locations where you have that information?
1 2 3 4 5	6 have some data on Pinecrest Presbyterian Camp. Q. Right. That was the purpose of the three wells at Pinecrest? A. Yes, sir. Q. But that's the only location you have actually got that data from was a three-well	4 1 2 3 4 5 6	65 to look more specifically in Jackson where that alignment is. Q. Okay. And any other locations where you have that information? A. No.
1 2 3 4 5 6 7	6 have some data on Pinecrest Presbyterian Camp. Q. Right. That was the purpose of the three wells at Pinecrest? A. Yes, sir. Q. But that's the only location you have actually got that data from was a three-well layout that's decimed for the purpose of actually	4 1 2 3 4 5 6 7	65 to look more specifically in Jackson where that alignment is. Q. Okay. And any other locations where you have that information? A. No. Q. Thank you. What is the range of storage coefficients within the Middle Claiporne Amifer
1 2 3 4 5 6 7	6 have some data on Pinecrest Presbyterian Camp. Q. Right. That was the purpose of the three wells at Pinecrest? A. Yes, sir. Q. But that's the only location you have actually got that data from was a three-well layout that's designed for the purpose of actually callecting that kind of information in an	4 1 2 3 4 5 6 7 8	65 to look more specifically in Jackson where that alignment is. Q. Okay. And any other locations where you have that information? A. No. Q. Thank you. What is the range of storage coefficients within the Middle Claiborne Aquifer in North Migginginging Tormagaeo2
1 2 3 4 5 6 7 8	6 have some data on Pinecrest Presbyterian Camp. Q. Right. That was the purpose of the three wells at Pinecrest? A. Yes, sir. Q. But that's the only location you have actually got that data from was a three-well layout that's designed for the purpose of actually collecting that kind of information in an unconfined againary is that correct?	4 1 2 3 4 5 6 7 8	65 to look more specifically in Jackson where that alignment is. Q. Okay. And any other locations where you have that information? A. No. Q. Thank you. What is the range of storage coefficients within the Middle Claiborne Aquifer in North Mississippi near Tennessee?
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Confidential Brian Waldron - September 27, 2017

	66		67
1	Q. And you said you had that and some other	1	Q. When you say two to three thousand on
2	information?	2	average, with the exception of the water that is
3	A. Age dating.	3	leaking through the confining layer down into the
4	Q. Age dating. And how old is that water?	4	Middle Claiborne Aquifer, can you give me some
5	A. It varies. And we see water as young as	5	idea of what the data range is that comes up with
6	50 years old entering into portions of the Middle	6	the two to three thousand year average, in other
7	Claiborne within Shelby County.	7	words, what kind of numbers?
8	Q. Okay. What about the water that is not	8	A. I don't understand.
9	leaking into but the water that's actually been	9	Q. Well, a two to three thousand year average
10	withdrawn from the Memphis Sparta Sand, how old is	10	means that is that the range, two to three
11	that water?	11	thousand years in which that water dating has
12	MR. BRANSON: Object to form.	12	shown results, or is it one to fifty thousand
13	Q. Have you age dated any of the water	13	years that comes down to you see what I'm
14	withdrawn from the Memphis Sparta Sand?	14	saying?
15	A. Yes.	15	A. I do. It's an estimate from the
16	Q. And how old is it?	16	methodology.
17	MR. BRANSON: Object to form. Vague.	17	Q. Okay.
18	A. The results are around two to three	18	A. That gives a plausibility of around two to
19	thousand on average years old.	19	three thousand years old. Sometimes you have
20	Q. And is that from where was that water	20	older water or not but
21	that was tested withdrawn from, what location?	21	Q. It's like the range around something
22	A. Age dating is taken from wells all	22	statistically. It's like some sort of factor?
23	throughout Shelby County.	23	A. Well, in that particular case you're
24	Q. Okay.	24	saying that you would have multiple data points,
25	A. So it varies.	25	and you could derive your average from that. This
	68		69
1	68 is just a method, and based upon the variability	1	A. No.
1 2	68 is just a method, and based upon the variability in the method itself and the parameters put into	1 2	 A. No. Q. No? The confined portion is not fully
1 2 3	68 is just a method, and based upon the variability in the method itself and the parameters put into it, you can get a plus or minus range.	1 2 3	69 A. No. Q. No? The confined portion is not fully saturated?
1 2 3 4	68 is just a method, and based upon the variability in the method itself and the parameters put into it, you can get a plus or minus range. Q. Okay. And so what is the is the plus	1 2 3 4	69 A. No. Q. No? The confined portion is not fully saturated? A. You can find portions fully saturated.
1 2 3 4 5	68 is just a method, and based upon the variability in the method itself and the parameters put into it, you can get a plus or minus range. Q. Okay. And so what is the is the plus or minus range two to three thousand, somewhere in	1 2 3 4 5	69 A. No. Q. No? The confined portion is not fully saturated? A. You can find portions fully saturated. Q. See, that's what happens when you have a
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1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21	<pre>68 is just a method, and based upon the variability in the method itself and the parameters put into it, you can get a plus or minus range. Q. Okay. And so what is the is the plus or minus range two to three thousand, somewhere in there? A. It's around two to three thousand years old. Q. Good. I'm not asking if it's 2000.037 to 3,000.120. A. Okay. Q. But we are in the we are right there in the ballpark of that. A. Okay. Q. Is that right? A. We are we typically state that the water in Shelby County in the Middle Claiborne is around two to three thousand years old. Q. Thank you. Now, the water in the Middle Claiborne predevelopment was all under pressure, right?</pre>	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21	 A. No. Q. No? The confined portion is not fully saturated? A. You can find portions fully saturated. Q. See, that's what happens when you have a lawyer asking these questions. We should get somebody who knows what they are talking about here. So the water in the confined aquifer is or the sand in the confined aquifer is fully saturated with water, is that correct, in the Middle Claiborne? A. Yes. Q. And it's fully saturated under pressure; is that correct? A. Correct. Q. And the same is true of water and formations both above and below the Middle Claiborne; is that correct? M. Correct. Q. And the same is true of of water and formations both above and below the Middle Claiborne; is that correct? M. No. Q. No?
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22	<pre>68 is just a method, and based upon the variability in the method itself and the parameters put into it, you can get a plus or minus range. Q. Okay. And so what is the is the plus or minus range two to three thousand, somewhere in there? A. It's around two to three thousand years old. Q. Good. I'm not asking if it's 2000.037 to 3,000.120. A. Okay. Q. But we are in the we are right there in the ballpark of that. A. Okay. Q. Is that right? A. We are we typically state that the water in Shelby County in the Middle Claiborne is around two to three thousand years old. Q. Thank you. Now, the water in the Middle Claiborne predevelopment was all under pressure, right? </pre>	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22	 A. No. Q. No? The confined portion is not fully saturated? A. You can find portions fully saturated. Q. See, that's what happens when you have a lawyer asking these questions. We should get somebody who knows what they are talking about here. So the water in the confined aquifer is or the sand in the confined aquifer is fully saturated with water, is that correct, in the Middle Claiborne? A. Yes. Q. And it's fully saturated under pressure; is that correct? A. Correct. Q. And the same is true of water and formations both above and below the Middle Claiborne; is that correct? M. KERANSON: Object to form. A. No. Q. No? A. No.
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23	 68 is just a method, and based upon the variability in the method itself and the parameters put into it, you can get a plus or minus range. Q. Okay. And so what is the is the plus or minus range two to three thousand, somewhere in there? A. It's around two to three thousand years old. Q. Good. I'm not asking if it's 2000.037 to 3,000.120. A. Okay. Q. But we are in the we are right there in the ballpark of that. A. Okay. Q. Is that right? A. We are we typically state that the water in Shelby County in the Middle Claiborne is around two to three thousand years old. Q. Thank you. Now, the water in the Middle Claiborne predevelopment was all under pressure, right? A. Depends upon location. 	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23	 A. No. Q. No? The confined portion is not fully saturated? A. You can find portions fully saturated. Q. See, that's what happens when you have a lawyer asking these questions. We should get somebody who knows what they are talking about here. So the water in the confined aquifer is or the sand in the confined aquifer is fully saturated with water, is that correct, in the Middle Claiborne? A. Yes. Q. And it's fully saturated under pressure; is that correct? A. Correct. Q. And the same is true of water and formations both above and below the Middle Claiborne; is that correct? M. NO. Q. No? A. No. Q. So the water in the unconfined aquifer
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24	<pre>68 is just a method, and based upon the variability in the method itself and the parameters put into it, you can get a plus or minus range. Q. Okay. And so what is the is the plus or minus range two to three thousand, somewhere in there? A. It's around two to three thousand years old. Q. Good. I'm not asking if it's 2000.037 to 3,000.120. A. Okay. Q. But we are in the we are right there in the ballpark of that. A. Okay. Q. Is that right? A. We are we typically state that the water in Shelby County in the Middle Claiborne is around two to three thousand years old. Q. Thank you. Now, the water in the Middle Claiborne predevelopment was all under pressure, right? A. Depends upon location. Q. Okay. The Middle Claiborne Aquifer is</pre>	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24	 A. No. Q. No? The confined portion is not fully saturated? A. You can find portions fully saturated. Q. See, that's what happens when you have a lawyer asking these questions. We should get somebody who knows what they are talking about here. So the water in the confined aquifer is or the sand in the confined aquifer is fully saturated with water, is that correct, in the Middle Claiborne? A. Yes. Q. And it's fully saturated under pressure; is that correct? A. Correct. Q. And the same is true of water and formations both above and below the Middle Claiborne; is that correct? M. BRANSON: Object to form. A. No. Q. So the water in the unconfined aquifer degine and formations approach and below the fully formation and formations both above and below the fully formations formations both above and below the fully formations both above and below the fully formations both above and below the fully formations formations formations formations formations formations formations
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25	<pre>68 is just a method, and based upon the variability in the method itself and the parameters put into it, you can get a plus or minus range. Q. Okay. And so what is the is the plus or minus range two to three thousand, somewhere in there? A. It's around two to three thousand years old. Q. Good. I'm not asking if it's 2000.037 to 3,000.120. A. Okay. Q. But we are in the we are right there in the ballpark of that. A. Okay. Q. Is that right? A. We are we typically state that the water in Shelby County in the Middle Claiborne is around two to three thousand years old. Q. Thank you. Now, the water in the Middle Claiborne predevelopment was all under pressure, right? Q. Okay. The Middle Claiborne Aquifer is fully saturated with water, right?</pre>	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25	 A. No. Q. No? The confined portion is not fully saturated? A. You can find portions fully saturated. Q. See, that's what happens when you have a lawyer asking these questions. We should get somebody who knows what they are talking about here. So the water in the confined aquifer is or the sand in the confined aquifer is fully saturated with water, is that correct, in the Middle Claiborne? A. Yes. Q. And it's fully saturated under pressure; is that correct? A. Correct. Q. And the same is true of water and formations both above and below the Middle Claiborne; is that correct? M. NO. Q. No? A. NO. Q. So the water in the unconfined aquifer degrifer does not reside under pressure?

Confidential Brian Waldron - September 27, 2017

	86		87
1	be in 2011, do you agree that Tennessee's	1	Q. Do you disagree with that?
2	groundwater pumping out of the confined Middle	2	MR. BRANSON: Object to form.
3	Claiborne Aquifer was approximately 258 million	3	A. I cannot speak to the specificity.
4	gallons a day for utility use and 50 million	4	Q. Of the numbers?
5	gallons a day for industrial use and that most of	5	A. Of the actual numbers. And those numbers
6	that came from Shelby County?	6	that you listed were for the three-state area.
7	MR. BRANSON: Object to form.	7	Q. Well, actually it says Tennessee is
8	A. I don't think Tennessee pumped it. You	8	highest among the three states.
9	know what I mean?	9	A. But the values you listed were
10	Q. I said out of the state of Tennessee.	10	Q. At. It says Tennessee among the three
11	A. You said Tennessee pumping.	11	states.
12	Q. Okay. That's a good point. Thank you.	12	A. But before that you said 258 million was
13	So I'm going to read this.	13	from where?
14	A. Okay.	14	Q. From Tennessee for public use and 50
15	Q. Groundwater usage for public supply and	15	million in Tennessee for industrial use. Now,
16	industry in Tennessee is highest among three	16	this just wouldn't be for Shelby County, and then
17	states. That would be Mississippi, Arkansas, and	17	it says the majority of the groundwater consumed
18	Tennessee.	18	in Tennessee occurs in Shelby County.
19	A. Uh-huh.	19	MR. DAVID BEARMAN: Object to the
20	Q. At 258 million gallons a day and 50	20	form.
21	million gallons a day respectively, which would be	21	MR. BRANSON: Object to the form.
22	for public supply and industry respectively. And	22	MR. DAVID BEARMAN: Mike, if we have
23	then the majority of the groundwater consumed in	23	this somewhere written down, that might be easier.
24	Tennessee occurs in Shelby County, Tennessee.	24	A. Is it in the EPA 2011 report? Very likely
25	A. Uh-huh.	25	those numbers were calculated and those numbers
	88		89
1	88 come from published USGS documents.	1	Q. Okay. But that's the best you're going to
1 2	88 come from published USGS documents. BY MR. ELLINGBURG:	1 2	89 Q. Okay. But that's the best you're going to do with that?
1 2 3	88 come from published USGS documents. BY MR. ELLINGBURG: Q. Okay. Thank you. Is the makeup of the	1 2 3	89 Q. Okay. But that's the best you're going to do with that? A. I have not researched it so I can't really
1 2 3 4	88 come from published USGS documents. BY MR. ELLINGBURG: Q. Okay. Thank you. Is the makeup of the sand formation in the Middle Claiborne Aquifer	1 2 3 4	 89 Q. Okay. But that's the best you're going to do with that? A. I have not researched it so I can't really give a valid opinion.
1 2 3 4 5	88 come from published USGS documents. BY MR. ELLINGBURG: Q. Okay. Thank you. Is the makeup of the sand formation in the Middle Claiborne Aquifer homogeneous and isotropic?	1 2 3 4 5	 89 Q. Okay. But that's the best you're going to do with that? A. I have not researched it so I can't really give a valid opinion. Q. What is your definition of an interstate
1 2 3 4 5 6	88 come from published USGS documents. BY MR. ELLINGBURG: Q. Okay. Thank you. Is the makeup of the sand formation in the Middle Claiborne Aquifer homogeneous and isotropic? A. In this area it is heterogeneous but	1 2 3 4 5 6	 89 Q. Okay. But that's the best you're going to do with that? A. I have not researched it so I can't really give a valid opinion. Q. What is your definition of an interstate groundwater resource?
1 2 3 4 5 6 7	<pre>88 come from published USGS documents. BY MR. ELLINGBURG: Q. Okay. Thank you. Is the makeup of the sand formation in the Middle Claiborne Aquifer homogeneous and isotropic? A. In this area it is heterogeneous but possibly isotropic.</pre>	1 2 3 4 5 6 7	 89 Q. Okay. But that's the best you're going to do with that? A. I have not researched it so I can't really give a valid opinion. Q. What is your definition of an interstate groundwater resource? A. It is one where the for the aquifer the
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Expert Report of Steven P. Larson

No. 143, Original

State of Mississippi v. State of Tennessee; City of Memphis, Tennessee; and Memphis Light, Gas & Water Division



June 30, 2017

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Section 1 Introduction and Background

1. This expert report was prepared by Steven P. Larson of S. S. Papadopulos & Associates, Inc. on behalf of the State of Tennessee. This report responds to the specific question posed by the Special Master in his August 12, 2016, opinion. In that opinion, the Special Master indicated that "*the threshold issue in this matter is whether the Aquifer is an interstate resource*" (SM Memorandum of Decision, August 12, 2016, page 36).

2. This report contains five sections, including this introductory section, Section 1. Section 2 contains a list of specific opinions and conclusions that I have reached in this case. Section 3 contains a narrative discussion of the bases for the opinions and conclusions contained in Section 2. Section 4 contains a summary of my qualifications and experience with more detail provided in my curriculum vitae that is Appendix A to this report, which includes my publications over the past 10 years and my testimony over the past 4 years. Section 5 lists various reports, documents, and other information that I specifically relied upon and that I considered in preparing this expert report.

3. In addition to relying on the reports, documents and information listed in Section 5, I have relied upon my education, training, and experience in the field of hydrology gained over the past 46 years. In this regard, I especially rely upon my experience in several interstate water disputes that involve surface and groundwater resource use and allocation among states, including: *Kansas v. Colorado*, No. 105, Orig.; *Nebraska v. Wyoming*, No. 108, Orig.; *Kansas v. Nebraska*, No. 126, Orig.; *Montana v. Wyoming*, No. 137, Orig.; and *South Carolina v. North Carolina*, No. 138, Orig.



Section 2 Opinions and Conclusions

4. The following is a list of my expert opinions developed based on a review of relevant scientific documents, reports, and other information and on my education and experience as a hydrologist specializing in groundwater hydrology. In short, I conclude that the groundwater of the Middle Claiborne aquifer is an interstate water resource based on these opinions:

Opinion 1. The Middle Claiborne aquifer and the groundwater within it constitute an interstate resource because they form a single hydrological unit that extends beneath eight states: Louisiana, Mississippi, Tennessee, Arkansas, Alabama, Kentucky, Illinois, and Missouri.

5. The Middle Claiborne aquifer constitutes a single hydrological unit and contains an interconnected body of groundwater that underlies parts of eight states. As in all aquifers, the groundwater in the Middle Claiborne aquifer is hydraulically and hydrologically connected. There is no physical impediment that precludes groundwater from migrating across State boundaries under natural conditions within the Middle Claiborne aquifer.

6. The geologic strata that constitute the Middle Claiborne aquifer are referred to by different names in different areas. For example, in Mississippi, the term Sparta Sand is used to refer to those geologic strata, while they are referred to as the Memphis Sand aquifer in Tennessee (as well as Missouri and some areas of Arkansas). Reports by the U. S. Geological Survey (USGS) refer to these same geologic strata as the Middle Claiborne Aquifer and provide a table that cross references different names that are used to refer to the same geologic strata (e.g., Hart et al., 2008, Table 1 at 2).¹

7. From a hydrological perspective, determining whether the Middle Claiborne aquifer constitutes an interstate resource requires a holistic consideration of all the groundwater within it. The groundwater in the Middle Claiborne aquifer cannot be meaningfully separated on a drop-by-drop basis, because that groundwater is not static and is continuously moving from one place to another. Although the physical migration process may occur relatively slowly (e.g., a few hundred feet per year), water that recharges or enters the aquifer cannot remain in one place. Instead, water that feeds into the Middle Claiborne aquifer from different sources of recharge is subject to the force of gravity and begins a journey toward places of discharge from the aquifer (Bell and Nyman, 1968 at 11).

8. The Middle Claiborne aquifer is a continuous hydrogeologic unit that spans a broad regional area and underlies parts of eight states. This hydrogeologic unit is composed largely of extensive deposits of sand with little interbedded clay. These extensive sand deposits allow the unit to contain large amounts of groundwater that can be pumped for water supply. The aquifer

¹ For simplicity, this report refers to this aquifer as the Middle Claiborne aquifer.

In the Matter Of:

STATE OF MISSISSIPPI vs STATE OF TENNESSEE OF TENNESSEE,

> STEVEN LARSON September 19, 2017



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Steven Larson - September 19, 2017

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1	opinion that predevelopment, before anybody
2	pumped, that water all of the water that
3	entered the state of Mississippi from its
4	recharge points necessarily flowed into the
5	State of Tennessee?
6	MR. BRANSON: Object to form.
7	A. I don't have that opinion.
8	Q. (BY MR. ELLINGBURG) Is it your opinion
9	that without regard to how the water naturally
10	flowed prepumping, that that water is still an
11	interstate natural resource available to
12	Tennessee?
13	MR. BRANSON: Object to form.
14	A. My opinion, as my report states, is
15	that aquifer system that we're dealing with here
16	is an interstate water resource.
17	Q. (BY MR. ELLINGBURG) Well, I'm asking a
18	little different question which has to do with
19	the water within the aquifer system. Is it your
20	opinion that the groundwater, all the
21	groundwater in the confined Memphis Sparta Sand
22	within the borders of the state of Mississippi,
23	is an interstate natural resource for
24	dovolopment in Tenneggeo?

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1	MR. DAVID BEARMAN: Object to the form,			
2	calls for a legal conclusion.			
3	A. My opinion is that the aquifer system			
4	and the water in it is an interstate water			
5	resource.			
6	Q. (BY MR. ELLINGBURG) Based on all your			
7	work and all these conflicts over all these			
8	years, is it your opinion that that fact, the			
9	fact that the aquifer crosses state boundaries,			
10	is sufficient to make the water in Mississippi			
11	an interstate resource available to other			
12	states?			
13	MR. DAVID BEARMAN: Same objection.			
14	MR. BRANSON: Same objection.			
15	A. The basis for my conclusion is that the			
16	aquifer and the water in it spans several states			
17	and that activities in one state can effect			
18	conditions in the other state or another state.			
19	Q. (BY MR. ELLINGBURG) Okay. Well, is it			
20	your opinion that activities in Tennessee have			
21	affected the water in Mississippi?			
22	A. The pumping in Tennessee has had			
23	effects that go into Mississippi.			
24	Q. Okay. Has one of those effects been to			

Steven Larson - September 19, 2017

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UPDATE REPORT ON DIVERSION AND WITHDRAWAL OF GROUNDWATER FROM NORTHERN MISSISSIPPI INTO THE STATE OF TENNESSEE ADDENDUM # 1

Prepared For:

Jim Hood, Attorney General of the State of Mississippi

July 31, 2017

Prepared By:

LEGGETTE, BRASHEARS & GRAHAM, INC. Professional Groundwater and Environmental Engineering Consultants 10014 North Dale Mabry Highway, Suite 205 Tampa, FL 33618



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DATE REVISED UPDATED REPORT ON DIVERSION AND WITHDRAWAL OF GROUNDWATER FROM NORTHERN LEGGETTE, BRASHEARS & GRAHAM, INC.	DRAWN BY: TDH
MISSISSIPPI INTO THE STATE OF TENNESSEE	DATE: Aug. 2017
PRE-DEVELOPMENT FLOW PATHS	IGURE NO.:
FILE NAME: FIGURE01.MXD Corel IN NORTHWESTERN MISSISSIPPI (813) 968-5882	1