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.

PLAINTIFF'S AND DEFENDANTS' JOINT STATEMENT OF STIPULATED AND CONTESTED FACTS

Plaintiff, the State of Mississippi ("Plaintiff"), and Defendants, the State of Tennessee, the City of Memphis, Tennessee, and Memphis Light, Gas & Water Division (collectively, "Defendants"), respectfully submit their Joint Statement of Stipulated and Contested Facts pursuant to the Joint Case Management Order dated November 1, 2017, as modified by the Orders Extending Certain Case Management Plan Deadline dated December 13, 2017, and February 20, 2018. Dkt. Nos. 61, 62, 63 ("Case Management Order").

INTRODUCTION

The Joint Case Management Order provides, in part, that, by February 27, 2018, "the parties shall meet and confer and file a joint final statement of stipulated

and contested facts. This statement shall contain citations to the record for each contested fact therein."

Counsel for the parties have met and conferred by electronic mail on numerous occasions, telephonically on at least six occasions, and once in person on February 9, 2018. This joint submission reflects the result of those conferences.

JOINT STATEMENT OF FACTS

In order to preserve the original order, organization and presentation of the parties' respective facts, this joint submission is organized as follows:

- **Section I**: Plaintiff's Facts P1-P105[1] with Defendants' Responses.
- **Section II**: Defendants Facts D1-D83 with Plaintiff's Responses.
- **Section III**: Stipulated Facts S1-S35 from Sections I and II.

This joint submission does not include the parties' respective objections concerning the relevancy / materiality of the other's facts. All such objections are

[1] During the meet and confer process, Plaintiff withdrew facts P7, 8, 15, 16, 19, 20, 95, 96, 97, 98, 99, 101. Accordingly, those fact numbers are omitted from Plaintiff's list.

reserved. Further, all stipulations are solely for purposes of the limited issue identified for this evidentiary hearing.

I. PLAINTIFF'S FACTS AND DEFENDANTS' RESPONSES

NO.	PLAINTIFF'S FACTS	DEFENDANTS' OBJECTIONS AND RESPONSES
P1	Plaintiff, State of Mississippi ("Mississippi"), is a sovereign State of the United States of America	**Stipulated.** *See* Section III, Fact S1.
P2	Defendant State of Tennessee ("Tennessee") is a sovereign State of the United States of America.	**Stipulated.** *See* Section III, Fact S2.
P3	Defendant City of Memphis, Tennessee ("Memphis") is a municipal corporation and, as such, a political subdivision of Tennessee with respect to governmental functions, but not with respect to proprietary functions.	**Stipulated.** *See* Section III, Fact S3.
P4	Defendant Memphis Light, Gas & Water Division ("MLGW") is a division of Memphis.	**Stipulated.** *See* Section III, Fact S4.
P5	On December 10, 1817, the United States Congress admitted Mississippi as the twentieth state to the Union on an equal footing with the original thirteen colonies.	**Stipulated.** *See* Section III, Fact S5.
P6	On June 1, 1796, the United States Congress admitted Tennessee as the sixteenth state to the	**Stipulated.** *See* Section III, Fact S6.

	Union on an equal footing with the original thirteen colonies.	
P9	Groundwater is a natural resource.	**Stipulated.** *See* Section III, Fact S9.
P10	Title 51 of the Mississippi Code Annotated provides for comprehensive regulation of both surface water and groundwater within Mississippi's territorial borders.	**Objection:** Defendants object to No. 10 because it is a legal conclusion. The Case Mgmt. Order requires these submissions to set forth "facts." Case Mgmt. Order at 2. As federal courts routinely hold, "legal conclusions are insufficient to 'set forth facts.'" *Cobin v. Rice*, 823 F. Supp. 1419, 1433 (N.D. Ind. 1993) (quoting Fed. R. Civ. P. 56(e)); *see also, e.g.*, *Flintkote Co. v. General Accident 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). **Response:** Subject to and without waiving their objection, Defendants state that No. 10 is a legal argument, and, therefore, no response is required.
P11	In 1985, the Mississippi Legislature reaffirmed its sovereign authority over all water within its borders, including groundwater, in an update to its existing water resource regulation in Miss. Code Ann. §§51-	**Objection**: Defendants object to No. 11 because it is a legal conclusion. Defendants adopt and incorporate the authority cited in their Objection to No. 10.

	3-1, et seq. Miss. Code Ann. § 51-3-1 reads as follows: It is hereby declared that the general welfare of the people of the State of Mississippi requires that the water resources of the state be put to beneficial use to the fullest extent of which they are capable, that the waste or unreasonable use, or unreasonable method of use, of water be prevented, that the conservation of such water be exercised with the view to the reasonable and beneficial use thereof in the interest of the people, and that the public and private funds for the promotion and expansion of the beneficial use of water resources shall be invested to the end that the best interests and welfare of the people are served. It is the policy of the Legislature that conjunctive use of groundwater and surface water shall be encouraged for the reasonable and beneficial use of all water resources of the state. The policies, regulations and public laws of the State of Mississippi shall be interpreted and administered so that, to the fullest extent possible, the ground and surface water resources within the state shall be integrated in their use, storage, allocation and management.	**Response**: Subject to and without waiving their objection, Defendants state that No. 11 is a legal argument, and, therefore, no response is required. However, it is undisputed that Miss. Code Ann. § 51-3-1 reads as stated.

	All water, whether occurring on the surface of the ground or underneath the surface of the ground, is hereby declared to be among the basic resources of this state to therefore belong to the people of this state and is subject to regulation in accordance with the provisions of this chapter. The control and development and use of water for all beneficial purposes shall be in the state, which, in the exercise of its police powers, shall take such measures to effectively and efficiently manage, protect and utilize the water resources of Mississippi.	
P12	"Groundwater" is defined by Mississippi to mean "water occurring beneath the surface of the ground." Miss. Code Ann. § 51-3-3(n) (2003).	**Objection**: Defendants object to No. 12 because it is a legal conclusion. Defendants adopt and incorporate the authority cited in their Objection to No. 10. **Response**: Subject to and without waiving their objection, Defendants state that No. 12 is a legal argument, and, therefore, no response is required. However, it is undisputed that Miss. Code Ann. § 51-3-3(n) (2003) reads as stated.
P13	Mississippi regulates the withdrawal and use of all surface water and groundwater contained within its borders. See, e.g., Miss. Code Ann. § 51-3-5(1) (2003) (stating that "[n]o person who is not specifically exempted by this chapter shall use water	**Objection**: Defendants object to No. 13 because it is a legal conclusion. Defendants adopt and incorporate the authority cited in their Objection to No. 10.

	without having first obtained a permit as provided herein . . . .”).	**Response**: Subject to and without waiving their objection, Defendants state that No. 13 is a legal argument, and, therefore, no response is required.
P14	Pursuant to the authority of the State Legislature, the Mississippi Department of Environmental Quality has enacted regulations to control the taking of groundwater and protect the sources of groundwater within the State of Mississippi. MS SCT 015634-61.	**Objection:** Defendants object to No. 14 because it is a legal conclusion. Defendants adopt and incorporate the authority cited in their Objection to No. 10. **Response:** Subject to and without waiving their objection, Defendants state that No. 13 is a legal argument, and, therefore, no response is required. However, for further response, Defendants state that No. 14 is disputed. The cited regulations, by their express terms, address the use and withdrawal of groundwater, not the “taking” of groundwater. Miss. Admin. P. Act, 11-7-1, *et seq*.
P17	Tennessee has declared “[t]hat the waters of the state are the property of the state and are held in public trust for the benefit of its citizens.” Tenn. Code Ann. § 68-221-702 (2013).	**Objection**: Defendants object to No. 17 because it is a legal conclusion. Defendants adopt and incorporate the authority cited in their Objection to No. 10. **Response**: Subject to and without waiving their objection, Defendants state that No. 17 is a legal argument, and, therefore, no response is required. However, it is undisputed that Tenn. Code Ann. § 68-221-702 (2013) reads in part as stated.

P18	Tennessee defines "ground water" to mean "water beneath the surface of the ground, whether or not flowing through known or definite channels." Id. § 68-221-703(13) (2013).	**Objection**: Defendants object to No. 18 because it is a legal conclusion. Defendants adopt and incorporate the authority cited in their Objection to No. 10. **Response**: Subject to and without waiving their objection, Defendants state that No. 18 is a legal argument, and, therefore, no response is required. However, it is undisputed that Tenn. Code Ann. § 68-221-703(13) (2013) reads in part as stated.
P21	The Mississippi Embayment is a syncline structural trough plunging to the south with an axis running along the path of the Mississippi River. Geologic subsidence accompanied by cyclic invasions of the sea stopping successively further south combined with differing Mississippi River flow conditions to create layered formations composed of deposits of sedimentary materials sloping west from eastern outcrops toward the bottom of the trough between 65 and 3 million years ago. It is found in parts of eight states and covers approximately 78,000 square miles within the North American Gulf Coastal Plain. Richard K. Spruill June 30, 2017 Expert Report ("Spruill Report") at 11-15; U.S. Geological Survey Professional Paper 1416-I, Ground-Water Flow	**Response**: No. 21 is undisputed as a general description of the Mississippi Embayment, except as follows. Defendants dispute that, in the area of the Tennessee-Mississippi border, the slope of the Memphis-Sparta Aquifer from the eastern outcrop toward the axis is west. It is north/northwest. Langseth[2] Dep. Ex. 4, Figure 3.2.5b. Further, Defendants note that the Mississippi Embayment has eastern and western outcrop areas that, generally speaking, slope toward the axis. Langseth Dep. Ex. 4, Figure 2.2.2.

[2] David E. Langseth, Sc.D., P.E., D.WRE, is an expert witness for the City of Memphis and Memphis Light, Gas & Water Division. Langseth was deposed on September 15, 2017.

	Analysis of the Mississippi Embayment Aquifer System, South-Central United States (1998) (MS SCT 002966) at I1.	
P22	The Mississippi Embayment contains both unconfined and confined geologic formations capable of holding, releasing, and transmitting groundwater in sufficient volumes for productive use. This qualifies these unconfined and confined formations as aquifers. Spruill Report at 7.	**Response**: No. 22 is disputed as written. However, Defendants do not dispute that a hydrogeological formation that is capable of holding, releasing, and transmitting groundwater in sufficient volumes for productive use and that contains such water is an aquifer. Langseth Dep. 39:11-17. Nor do Defendants dispute that the Mississippi Embayment contains aquifers that have both confined and unconfined areas, provided that a confined and an unconfined aquifer are defined as follows: An aquifer or area of an aquifer is "confined" if it has an overlying confining layer in which the pressure in the aquifer is high enough that the potentiometric head in the aquifer rises above the bottom of that confining layer. Spruill[3] Dep. Ex. 1, at 8, 28; Langseth Dep. Ex. 1, §§ 1.5, 2.1, at 3, 7; Larson[4] Dep. Ex. 1, at 7; Ralph C. Heath, *Basic Ground-Water Hydrology*, USGS Water-Supply Paper 2220, at 6 (1983) (hereinafter "Heath, *Basic Ground-Water Hydrology*"), *available at*

[3] Richard K. Spruill, Ph.D., PG, is an expert witness for the State of Mississippi. Spruill was deposed on September 28, 2017.

[4] Steven P. Larson is an expert witness for the State of Tennessee. Larson was deposed on September 19, 2017.

		https://pubs.usgs.gov/wsp/2220/report.pdf. An aquifer or area in an aquifer is "unconfined" when the potentiometric head is below the overlying confining layer or when an overlying confining layer is not present. Spruill Dep. Ex. 1, at 8; Langseth Dep. Ex. 1, § 2.1, at 7; Heath, *Basic Ground-Water Hydrology* at 6.
P23	The availability and movement of groundwater in unconfined and confined aquifers is significantly different. Spruill Report at 24-28.	**Objection**: Defendants object to No. 23 because the term "significantly different" is undefined, vague, and ambiguous. **Response**: Subject to and without waiving Defendants' objection, No. 23 is disputed. The availability and movement of groundwater in confined and unconfined areas of an aquifer can vary because aquifer characteristics, such as storage coefficients, vary between confined and unconfined aquifers or portions of aquifers. *E.g.*, Larson Dep. 106:3-11. However, the availability and movement of groundwater in confined and unconfined aquifers have substantial similarities, as well. For example, groundwater in both confined and unconfined aquifers moves from higher potentiometric head to lower potentiometric head. Spruill Dep. Ex. 1, at 8-9; Langseth Dep. Ex. 1, § 2.1, at 6. Further, in both the confined and unconfined areas of the Memphis-Sparta Aquifer in the Tennessee-Mississippi border area, the

		flow direction of groundwater is perpendicular to the equipotential lines. Wiley[5] Dep. 45:2-46:12, Ex. 5.
P24	The Mississippi Embayment is not a monolithic homogeneous geological formation. Rather, it consists of diverse stratigraphic deposits, including generally confined sand formations that are saturated with water and separated by deposits of clay of very low permeability in layers predominantly sloping toward the Mississippi River. Spruill Report at 11-17; Richard K. Spruill July 31, 2017, Rebuttal Report ("Sprull Rebuttal") at 24-25.	**Response**: No. 24 is undisputed as a general description of the Mississippi Embayment except as noted below. First, Defendants note that the various formations in the Mississippi Embayment are hydrologically connected. Langseth Dep. Ex. 1, § 2.2, at 7-10; Wiley Dep. 188:17-189:15; Larson Dep. Ex. 1, at 12; Spruill Dep. 39:5-10, 40:2-10. Second, the bottom of the Memphis-Sparta Aquifer in the area of the Tennessee-Mississippi border slopes to the north/northwest. Langseth Dep. Ex. 4, Figure 3.2.5b.
P25	The confined and unconfined sand formations spread throughout the Mississippi Embayment vary in geographic coverage, thickness, permeability, specific yield, water quality, and other characteristics.	**Stipulated.** *See* Section III, Fact S8.
P26	Unlike rivers and streams that generally reveal their presence and water supply at the surface, each confined and unconfined aquifer has unique characteristics based on the local geology which determines the groundwater's origin, movement, quality, availability, and the amount of development	**Objection**: Defendants object to No. 26 because it is vague and ambiguous. **Response**: Subject to and without waiving Defendants' objection, No. 26 is disputed as written. The source of a river or stream is not always revealed

[5] David A. Wiley, P.E., is an expert witness for the State of Mississippi. Wiley was deposed on September 26, 2017.

	through pumping that can be undertaken with long-term sustainability. Spruill Rebuttal at 4.	on the surface and may be underground. However, Defendants do not dispute that each aquifer, river, and stream has unique characteristics based on local geology; and that the origin, movement, quality, availability, and capacity to develop through pumping from each aquifer, river, and stream can be influenced or determined by local geology. Thomas C. Winter, Judson W. Harvey, O. Lehn Franke & William M. Alley, *Ground Water and Surface Water: A Single Resource*, USGS Circular 1139, at 9-17, 33-53 (1998) (hereinafter "Winter et al., *Ground Water and Surface Water*"), *available at* https://pubs.usgs.gov/circ/circ1139/. Further, Defendants do not dispute that a confined aquifer's local geology is one factor that affects the hydrological characteristics of the groundwater, including its origin, movement, quality, and availability**.**
P27	The Claiborne Group is a package of sediments deposited in the Mississippi Embayment approximately 40 million years ago during the middle of the Eocene Epoch of the Cenozoic Era.	**Stipulated.** *See* Section III, Fact S9.
P28	Historically, the Middle Claiborne formation in Tennessee has been called the "500 foot sand" or "Memphis Sand." Spruill Report at 16.	**Response**: It is undisputed that the Middle Claiborne formation in Tennessee and Mississippi has been called the "Memphis-Sparta Aquifer," "Sparta Sand," "Sparta/Memphis Sand," "Sparta-Memphis Sand,"

		"Sparta-Aquifer Sand," "Memphis Sand," "Memphis Aquifer," "Middle Claiborne Aquifer," "Middle Claiborne," "Memphis Sparta Sand Aquifer," "MSSA," "500 foot sand," and "Sparta Memphis Sand." Wiley Dep. 9:14-10:12; Langseth Dep. Ex. 1, §§ 1.5, 2.3, at 4, 10-13, Ex. 4, Tables B.4.1, C.3.1; Larson Dep. Ex. 1, at 12. *See also* Spruill Dep. 8:14-9:9.
P29	In Mississippi the Middle Claiborne formation has several distinct units as defined by the United States Geological Survey, including the "Sparta Sand" formation, which is at the top of the Middle Claiborne and is correlative to the upper part of the Memphis Sand in Tennessee. *Id*.; Spruill Rebuttal at 2.	**Response**: No. 29 is disputed as written because the Middle Claiborne Aquifer (i.e., the Memphis-Sparta Aquifer) consists of a single "distinct geological formation" – "an aquifer that is distinct from other rock matrices around it" – that lies beneath both Mississippi and Tennessee. Wiley Dep. 9:14-24, 63:24-64:8; *see also* Larson Dep. Ex. 1, at 2. However, Defendants do not dispute that the Sparta Aquifer and the upper Memphis Sand Aquifer comprise a continuous and correlative hydrogeological unit (i.e., the Memphis-Sparta Aquifer). Spruill Dep. 9:4-9; Wiley Dep. 9:14-10:4.
P30	The Sparta Sand formation in north Mississippi begins as a large surface outcrop within Mississippi and descends with an east-to-west/southwest slope while the formation thickens as it moves toward the	**Response:** No. 30 is disputed as written because the slope of the Memphis-Sparta Aquifer in the area of the Tennessee-Mississippi state line is from the eastern outcrop to north/northwest. Langseth Dep. Ex. 4, Figure 3.2.5b. However, Defendants do not dispute that the Memphis-Sparta Aquifer has a large surface

	Mississippi River. David Wiley June 30, 2017, Expert Report ("Wiley Report") at 9.	outcrop along its eastern edge in both Mississippi and Tennessee. Wiley Dep. Ex. 1, at 9. Nor do Defendants dispute that the aquifer thickens as it moves from the eastern, outcrop area to the Mississippi River.
P31	The Sparta Sand in north Mississippi is a thick, variable sand formation made up of fine to very coarse sand with lenses of clay and silt. *Id.*	**Response**: No. 31 is disputed as written. However, Defendants do not dispute that the entire Memphis-Sparta Aquifer in northwest Mississippi and southwest Tennessee is a thick, variable sand formation made up of fine to very coarse sand with lenses of clay and silt. Spruill Dep. Ex. 1, at 3, 14; Waldron[6] Dep. Ex. 1, at 10; Larson Dep. Ex. 1, at 9, 12; Langseth Dep. Ex. 1, § B.4, at B-4.
P32	The Sparta Sand in north Mississippi occurs at a depth of 0 to 600 feet, and varies in thickness between 200 and 900 feet. *Id*.	**Response:** No. 32 is disputed. There are differing figures in the technical literature for the thickness of the Memphis-Sparta Aquifer in north Mississippi and southwest Tennessee. Larson Dep. Ex. 1, at 9; D.D. Graham & W.S. Parks, *Potential for Leakage Among Principal Aquifers in the Memphis Area, Tennessee*, USGS Water-Resources Investigations Report 85-4295, at 6 (1986), *available at* https://pubs.usgs.gov/wri/wri85-4295/pdf/wrir_85-4295_a.pdf; W.S. Parks & J.K. Carmichael, *Geology*

[6] Brian Waldron, Ph.D., P.E., is an expert witness for the State of Tennessee. Waldron was deposed on September 27, 2017.

		and Ground-Water Resources of the Memphis Sand in Western Tennessee, USGS Water-Resources Investigations Report 88-4182, at 5 (1990), *available at* https://pubs.usgs.gov/wri/wrir88-4182/html/pdf.html; Gerald K. Moore, *Geology and Hydrology of the Claiborne Group in Western Tennessee*, Geological Survey Water-Supply Paper 1809-F, at F1 (1965) (hereinafter "Moore, *Geology and Hydrology*"), *available at* https://pubs.usgs.gov/wsp/1809f/report.pdf; J.H. Criner, P-C. P. Sun & D.J. Nyman, *Hydrology of Aquifer Systems in the Memphis Area, Tennessee*, Geological Survey Water-Supply Paper 1779-O, at O10 (1964) (hereinafter "Criner et al., *Hydrology of Aquifer Systems*"), *available at* https://pubs.usgs.gov/wsp/1779o/report.pdf.
P33	Except for those portions in the outcrop area, where it is unconfined, the Sparta Sand formation in north Mississippi is "confined," i.e., sandwiched between upper and lower clay formations which are of very low permeability. *Id*.	**Response**: No. 33 is disputed as written. Defendants do not dispute that some areas of the Memphis-Sparta Aquifer in north Mississippi, and in southwest Tennessee, are sandwiched between upper and lower clay formations of very low permeability. Spruill Dep. 36:13-16.
P34	The confined Sparta Sand formation in north Mississippi shares the same upper confining	**Response**: Defendants do not dispute that the Memphis Sand and Sparta Sand, which are different names for the Memphis-Sparta Aquifer, *see*, *e.g.*, Wiley Dep. 9:14-10:12; Spruill Dep. 8:14-9:9, have

	formation as the confined Memphis Sand. Spruill Report at 16; MS SCT 002966 at Figure 5.	the same upper confining formation, where an upper confining formation exists.
P35	Under natural conditions, and over many thousands of years, the Sparta Sand formation beneath present-day Mississippi became saturated with high-quality groundwater stored as a fairly constant volume under significant hydrostatic pressure. Wiley Report at 9-10.	**Response:** No. 35 is disputed as written. However, Defendants do not dispute that, under natural conditions and over many thousands of years, the Memphis-Sparta Aquifer beneath present-day Mississippi, Tennessee, Kentucky, Illinois, Missouri, Arkansas, and Louisiana was saturated with high-quality groundwater. Spruill Dep. Ex. 1, at 13, 14, 21; Langseth Dep. Ex. 1, §§ 1.5, 2.2, at 4, 7-8. Nor do Defendants dispute that the groundwater in the Memphis-Sparta Aquifer in the area of northwest Mississippi-southwest Tennessee has remained at a fairly constant volume under pressure. However, Defendants note that the water constituting that volume is constantly changing as water moves in and out of the Aquifer. Wiley Dep. 100:8-18; Larson Dep. Ex. 1, at 8; Spruill Dep. 41:24-42:4.
P36	Under natural conditions, precipitation falling within Mississippi's borders collects on the Sparta Sand formation outcrops in Mississippi, is drawn by gravity into the unconfined portion of the formation, descends and seeps slowly down-gradient, enters the confined formation, and continues to move down and	**Response:** No. 36 is disputed as written. Defendants do not dispute that, under natural conditions, some of the precipitation falling in both Mississippi and Tennessee collected in the eastern outcrop area of the Memphis-Sparta Aquifer and was drawn by gravity into the unconfined areas of the Memphis-Sand Aquifer (in both states). Wiley Dep. Ex. 1, Figure 5; Langseth Dep. Ex. 4, Figure C.3.1; *see also* Wiley

	along the natural east-to-west/southwest dip of the formation. *Id*.	Dep. 13:13-16, 14:8-11, 14:13-17; Spruill Dep. Ex. 1, at 18; Langseth Dep. Ex. 1, §§ 2.2, 3.2, at 8-9, 16-19; Larson Dep. Ex. 1, at 12. Nor do Defendants dispute that some of this water descended and seeped down-gradient, entered the confined formation, and continued to move down and toward the axis of the formation, until it discharged to the surface. Spruill Dep. Ex. 1, at 23; Wiley Dep. Ex. 1, at 9-10; Larson Dep. Ex. 1, at 12. However, Defendants dispute that the formation has a natural east-to-west/southwest dip. The direction of the natural dip of the Memphis-Sparta Aquifer in the region of the Tennessee-Mississippi state line is east to west/northwest. Spruill Dep. Ex. 1, at 2; Langseth Dep. Ex. 4, Figure 3.2.5b.
P37	Groundwater naturally residing in the confined Sparta Sand formation in Mississippi resides under pressure in the pore spaces of the sand and other geologic materials comprising the Sparta Sand formation. *Id*.	**Objection**: Defendants object to No. 37 because the terms "residing" and "resides" are undefined, vague, and ambiguous. **Response**: Subject to and without waiving Defendants' objection, No. 37 is disputed as written. However, Defendants do not dispute that groundwater in the confined and unconfined areas of the Memphis-Sparta Aquifer in both Mississippi and Tennessee is under pressure in the pore spaces of the sand and other geologic materials comprising the Memphis-Sparta Aquifer. Spruill Dep. Ex. 1, at 4; Langseth Dep. Ex.

		1, § 2.1, at 6; Larson Dep. Ex. 1, at 9; *see also* Wiley Dep. 22:23-23:6; Spruill Dep. 36:13-16, 77:4-14.
P38	Groundwater naturally residing in the confined Sparta Sand formation in Mississippi oozes, seeps, and filters through the pore spaces of the Sparta Sand formation. *Id.*	**Objection**: Defendants object to No. 38 because the term "residing" is undefined, vague, and ambiguous. **Response**: Subject to and without waiving Defendants' objection, No. 38 is disputed as written. However, Defendants do not dispute that groundwater in the confined and unconfined areas of the Memphis-Sparta Aquifer in both Tennessee and Mississippi moves through the pore spaces. Spruill Dep. Ex. 1, at 4; Langseth Dep. Ex. 1, § 2.1, at 6; Larson Dep. Ex. 1, at 9; *see also* Wiley Dep. 22:23-23:6; Spruill Dep. 41:14-17, 41:24-42:4, 77:4-14, Ex. 4, at 27-28; Wiley 2007 Dep. 29:8-15, 30:4-7; Crawford[7] 2007 Dep. 89:12-16, 89:20-22, 102:18-19; Hoffman[8] 2007 Dep. 24:15-18; Langseth Dep. Ex. 1, § 3.5, at 22-23; Larson Dep. Ex. 1, at 4, 20-21.
P39	Movement from one pore space to another within the confined Sparta Sand is induced by pressure differentials. Spruill Report at 9.	**Response**: No. 39 is disputed as written. However, Defendants do not dispute that potentiometric differentials, reflecting pressure and elevation, cause

[7] Jamie Crawford testified as a Rule 30(b)(6) designee for the State of Mississippi's Department of Environmental Quality in the federal district court lawsuit on July 30, 2007.

[8] Jim Hoffman testified as a Rule 30(b)(6) designee for the State of Mississippi's Department of Environmental Quality in the federal district court lawsuit on July 30, 2007.

		water to move from one pore space to another within the confined and unconfined areas of the Memphis-Sparta Aquifer. Larson Dep. Ex. 1, at 9; Langseth Dep. Ex. 1, §§ 1.5, 2.1, at 4, 6; Winter et al., *Ground Water and Surface Water* at 7; R. Allan Freeze & John A. Cherry, *Groundwater* 18-21 (Prentice-Hall 1979) (hereinafter "Freeze & Cherry, *Groundwater*").
P40	Under natural conditions, in the absence of pumping, the rate of movement, or flow, of groundwater in the confined Sparta Sand formation in Mississippi is extremely slow, moving at a rate of about an inch a day. Wiley Report at 9-10.	**Objection**: Defendants object to No. 40 because the term "extremely slow" is undefined, vague, and ambiguous. **Response**: Subject to and without waiving Defendants' objection, No. 40 is disputed as written. Defendants dispute that, under pre-development conditions, the rate of movement or flow of all groundwater in the confined Memphis-Sparta Aquifer is about an inch a day. Larson Dep. Ex. 1, at 8. Cf. Response to No. 47, infra (a few inches a day); Response to No. 43, infra (13-53 feet per year). However, Defendants do not dispute that, under pre development conditions, the speed of groundwater flow in the entire Memphis-Sparta Aquifer is slow relative to the speed of turbulent surface water flow in a stream. Spruill Dep. 41:14-17, 41:24-42:4, Ex. 4, at

		27-28; Wiley 2007[9] Dep. 29:8-15, 30:4-7; Crawford 2007 Dep. 89:12-16, 89:20-22, 102:18-19; Hoffman 2007 Dep. 24:15-18; Langseth Dep. Ex. 1, § 3.5, at 22-23; Larson Dep. Ex. 1, at 4, 20-21.
P41	Under natural, predevelopment conditions, all but a very small portion of the groundwater in the Sparta Sand formation in north Mississippi flows east-to-west/southwest within Mississippi, essentially parallel to, or descending from, the Mississippi-Tennessee border, residing in Mississippi for thousands of years. Wiley Report at 11; Spruill Report at 23-24; David Wiley July 31, 2017, Rebuttal Report ("Wiley Rebuttal") at 4.	**Objection:** Defendants object to No. 41 because the terms "very small," "essentially parallel," and "residing" are undefined, vague, and ambiguous. **Response:** Subject to and without waiving Defendants' objection, No. 41 is disputed as written. Defendants do not dispute that, under natural, pre-development conditions, some groundwater in the Memphis-Sparta Aquifer moved from north Mississippi in a west-southwest direction toward Arkansas, and some groundwater in the Memphis-Sparta Aquifer naturally moved from north Mississippi in a north-northwest direction into Tennessee. Wiley Dep. Ex. 1, Figures 9, 23, Ex. 2, Figure 5; Spruill Dep. Ex. 1, at 36, Figure 17; Langseth Dep. Ex. 4, Figures 3.3.1b, 3.3.2a, 3.3.2b, 3.3.3. However, Defendants dispute that all but a very small portion of the groundwater in the Sparta Sand

[9] David Wiley was also an expert witness for Mississippi in the federal district court lawsuit. He was originally deposed on November 15-16, 2007. Pursuant to paragraph 4(c) of the Case Management Plan entered on October 26, 2016, by the Special Master (Dkt. No. 57), deposition testimony from the federal district court litigation is deemed part of the discovery record in these proceedings.

		formation in north Mississippi flowed east-to-west/southwest within Mississippi, essentially parallel to, or descending from, the Mississippi-Tennessee border under natural conditions. Waldron Dep. Ex. 1, at 25-26, Figure 13; Langseth Dep. Ex. 1, § 3.2.2.1, at 17. The area of pre-development flow from Mississippi to Tennessee in the Memphis-Sparta Aquifer covered the majority of the shared Mississippi-Tennessee state border from the Mississippi River to the eastern edge of the outcrop area. Spruill Dep. 142:8-16, Ex. 1, at 36, Figure 17; Wiley Dep. 14:18-15:14, 71:18-21, 73:3-19, 96:19-23, 141:6-142:9, 163:22-164:7, Ex. 1, Figures 9, 23, Ex. 2, Figure 5; Langseth Dep. Ex. 1, §§ 3.2.2.1, 3.3, at 17, 19-20; Gentry 2007 Dep. 165:12-16.[10]
P42	Essentially all of the groundwater entering the confined Sparta Sand formation in north Mississippi resides in Mississippi under natural, predevelopment conditions until its natural discharge at the Mississippi River alluvial aquifer system near the river for thousands of years after entering the formation. Wiley Report at 11; Wiley Rebuttal at 4.	**Objection**: Defendants object to No. 42 because the terms "essentially all" and "resides" are undefined, vague, and ambiguous. **Response**: Subject to and without waiving Defendants' objection, No. 42 is disputed. Although some groundwater entering the confined areas of the Memphis-Sparta Aquifer in north Mississippi ultimately discharged into the Mississippi River

[10] Randall W. Gentry, Ph.D., P.E., testified at a deposition on August 7, 2007, pursuant to a subpoena served by the State of Mississippi in the federal district court lawsuit.

		alluvial aquifer, significant portions of this water flowed into Tennessee and Arkansas. Waldron Dep. Ex. 1, at 25-26, Figure 13; Langseth Dep. Ex. 1, § 3.2.2.1, at 17; Wiley Dep. 151:7-160:18, Ex. 2, Figure 1.
P43	Under natural, predevelopment conditions, this groundwater resides in Mississippi for approximately 4,000 years to 22,000 years and moves at a rate of 13 to 53 feet per year. Wiley Rebuttal at 4.	**Objection:** Defendants object to No. 43 because the term "resides" is undefined, vague, and ambiguous. **Response**: Subject to and without waiving Defendants' objection, No. 43 is disputed as written. Defendants do not dispute that, under pre-development conditions, some groundwater entered the confined areas of the Memphis-Sparta Aquifer in north Mississippi and flowed through Mississippi until it ultimately discharged into the Mississippi River alluvial aquifer. However, Defendants dispute that "essentially all" of the groundwater entering the confined areas of the Memphis-Sparta Aquifer in north Mississippi, *see* Response to No. 42, *supra*, traveled through Mississippi for 4,000 to 22,000 years, or that it generally moves at a rate of 13-53 feet per year. *See* Wiley Dep. 151:7-160:18, Ex. 2, Figure 1; Waldron Dep. Ex. 1, at 26, Figure 13; Langseth Dep. Ex. 1, § 3.2.2.1, at 17. *Cf.* Response to No. 40, *supra* (an

		inch a day); Response to No. 47, *infra* (a few inches a day).
P44	This groundwater would never move into and be available within Tennessee's borders under natural conditions. Wiley Report at 11.	**Response**: No. 44 is disputed. Waldron Dep. Ex. 1, at 26, Figure 13; Langseth Dep. Ex. 1, § 3.2.2.1, at 17.
P45	Only in a very small area in northeast DeSoto County, Mississippi, does groundwater residing in the confined Sparta Sand formation in Mississippi ultimately flow into Tennessee under natural, predevelopment conditions. *Id*. at 7 and 10-11.	**Objection**: Defendants object to No. 45 because the terms "very small" and "residing" are undefined, vague, and ambiguous. **Response**: Subject to and without waiving Defendants' objection, No. 45 is disputed as written. Defendants do not dispute that, under natural, pre development conditions, groundwater in the confined Memphis-Sparta Aquifer in northeast DeSoto County, Mississippi, flowed into Tennessee. However, Defendants dispute that this flow was limited to a "very small area in northeast DeSoto County, Mississippi." Under natural, pre development conditions, groundwater in the confined and unconfined Memphis-Sparta Aquifer moved from north Mississippi into Tennessee across the majority of the shared Mississippi-Tennessee boundary from the Mississippi River to the eastern edge of the outcrop. Spruill Dep. 142:8-16, Ex. 1, at 36, Figure 17; Wiley Dep. 14:18-15:14, 71:18-21, 73:3-19, 96:19-23, 141:6-142:9, 163:22-164:7, Ex. 1, Figures

		9, 23, Ex. 2, Figures 2, 3, 5; Langseth Dep. Ex. 1, §§ 3.2.2.1, 3.2.2.2, 3.2.2.3, 3.3, at 17-20, Ex. 4, Figures 3.2.1a, 3.2.1b, 3.2.3, 3.2.4a, 3.2.4b, 3.3.1a, 3.3.1b, 3.3.2, 3.3.2b, Ex. 5, §§ 2.3, 2.4, at 8-11, Figures R.1a, R.1b, R.1c, R.1d, R.2a, R.2b; Gentry 2007 Dep. 165:12-16.
P46	Groundwater entering the confined Sparta Sand formation in north Mississippi that flows into Tennessee under natural, predevelopment conditions, resides in Mississippi for a very long time before flowing into Tennessee. Deposition of Richard Spruill (September 28, 2017) ("Spruill Dep.") at 142-144. Based on USGS MERAS particle tracking results, under natural conditions, groundwater entering the confined Sparta Sand at the east DeSoto County line approximately 1,000 feet from the Tennessee border would not arrive in Tennessee during a normal human lifetime. Wiley Rebuttal at Figure 1.	**Objection:** Defendants object to No. 46 because the terms "very long" and "reside" are undefined, vague, and ambiguous. **Response**: Subject to and without waiving their objection, Defendants state that, as to the first sentence of No. 46, it is undisputed that groundwater in the Memphis-Sparta Aquifer in north Mississippi flowed into Tennessee under natural, pre development conditions. However, without a definition of "very long time," Defendants are not able to determine if the remainder of No. 46 is disputed. The second sentence in No. 46 is disputed because it is not supported by the cited authority. Wiley Dep. 156:22-157:10, Ex. 2, Figure 1.
P47	Groundwater in the confined Sparta Sand formation has nothing in common with flowing surface water except the core chemical composition of water itself. Through natural processes this groundwater was filtered through the pores of sand following the pull	**Objection:** Defendants object to the first sentence of No. 47 as vague and unsupported by any citation to the record, as required by the Case Mgmt. Order.

	of gravity at about an inch a day, ultimately saturating the pores of the sand under pressure created by the weight of the earth above the confined formation and the water accumulated up dip in the formation to the east. Wiley Report at 9-11.	**Response**: Subject to and without waiving Defendants' objection, No. 47 is disputed. First, groundwater in the Memphis-Sparta Aquifer and surface water have characteristics in common, besides being composed of molecules of H_2O, including, without limitation, both move, both are subject to gravity, and both are unaffected by state political boundaries. Second, it is disputed that the water was moving at about an inch a day at all times or in all places, but undisputed that the water was moving slowly relative to the speed of turbulent surface water. Larson Dep. Ex. 1, at 8. *Cf.* Response to No. 40, *supra* (an inch a day); Response to No. 43, *supra* (13-53 feet per year). Third, No. 47 is not supported by the cited authority, which contains no discussion about the "weight of the earth." *See* Wiley Dep. Ex. 1, at 9-11. Fourth, the weight of the earth above the confined formation does not contribute to water pressure in the aquifer. T. William Lambe & Robert V. Whitman, *Soil Mechanics, SI Version* 241-42 (1979); Freeze & Cherry, *Groundwater* at 53-54. Defendants do not dispute that the groundwater in the Memphis-Sparta Aquifer was filtered through the pores of sand based on differentials in potentiometric head (which includes consideration of pressure and elevation). Langseth Dep. Ex. 1, § 1.5, at 4; Winter et al., *Ground*

		Water and Surface Water at 7; Freeze & Cherry, *Groundwater* at 18-21.
P48	Groundwater in the confined Sparta Sand formation in Mississippi is not part of a subterranean river or stream flowing through distinct channels. Wiley Report at 9-11; Spruill Rebuttal at 37.	**Response**: It is undisputed that groundwater in the confined portions of the Memphis-Sparta Aquifer is not part of a subterranean river or stream flowing through distinct channels (based on the plain meaning of the terms river, stream, and distinct channels).
P49	Groundwater in the confined Sparta Sand formation in Mississippi is not a body of water located in underground caverns nor part of an underground lake. Wiley Report at 9-11; Waldron Dep. at 95.	**Response:** No. 49 is disputed because the statement is not supported by the cited authority. Further, Defendants dispute Plaintiff's assertion that the Memphis-Sparta Aquifer is not a "body of water." *See* Larson Dep. Ex. 1, at 10. However, Defendants do not dispute that the groundwater in the confined areas of the Memphis-Sparta Aquifer is not located in underground caverns or part of an underground lake (based on the plain meaning of those terms).
P50	Under natural conditions, groundwater in the Sparta Sand formation in north Mississippi would remain within Mississippi as an available natural resource for Mississippi and its people at predevelopment volumes and pressures following its natural path for thousands of years. Wiley Report at 9-11; Wiley Rebuttal at 4.	**Objection**: Defendants object to No. 50 because the statement that the groundwater is "an available natural resource for Mississippi and its people" is a legal conclusion. Defendants adopt and incorporate the authority cited in their Objection to No. 10. **Response**: Subject to and without waiving Defendants' objection, No. 50 is disputed. While Defendants do not dispute that under pre-development

		conditions some groundwater in the Memphis-Sparta Aquifer in north Mississippi would flow within Mississippi following its natural path for thousands of years, all groundwater in the Memphis-Sparta Aquifer beneath Mississippi has left or ultimately will leave Mississippi. Langseth Dep. Ex. 1, § 1.2, at 2; Wiley Dep. 192:22-193:1, 193:16-23.
P51	The groundwater residing in the confined Sparta Sand formation within Mississippi's borders is an intrastate natural resource subject to protection, regulation and preservation only by the State of Mississippi. Wiley Report at 9-11; Wiley Rebuttal at 4; Miss. Code Ann. §§ 51-3-1, et seq.	**Objection:** Defendants object to No. 51 because it is a legal conclusion. Defendants adopt and incorporate the authority cited in their Objection to No. 10. **Response:** Subject to and without waiving their objection, Defendants state that No. 51 is a legal argument, and, therefore, no response is required.
P52	MLGW is a municipal utility selling water, gas, and electricity to customers in the Memphis area, including Shelby County, Tennessee.	**Stipulated.** *See* Section III, Fact S10.
P53	MLGW operates one of the world's largest artesian groundwater pumping and distribution systems. Wiley Report at 5.	**Response**: Defendants do not have sufficient information to determine whether No. 53 is or is not disputed.
P54	MLGW's groundwater pumping system currently consists of more than 160 wells in ten well fields, all located in Shelby County, Tennessee.	**Stipulated.** *See* Section III, Fact S11.

P55	The southern boundary of Shelby County is located on the Tennessee-Mississippi border and adjoins the northern boundary of Desoto County, Mississippi, and the northwestern boundary of Marshall County, Mississippi.	**Stipulated.** *See* Section III, Fact S12.
P56	MLGW's ten well fields are the Allen, Davis, Lichterman, LNG, Mallory, McCord, Morton, Palmer, Shaw and Sheahan fields. Wiley Report at Table 1.	**Stipulated.** *See* Section III, Fact S13.
P57	All of the wells in the Davis and Palmer well fields and most of the wells in the Lichterman well field are located within two to three miles of the Mississippi-Tennessee border on the Tennessee side.	**Stipulated.** *See* Section III, Fact S14.
P58	MLGW's wells mechanically pump groundwater from the Memphis Sand. Wiley Report at 5-6.	**Response**: Assuming that "Memphis Sand" means "Memphis-Sparta Aquifer," No. 58 is undisputed.
P59	Between 1965 and 2000, MLGW's pumping of water from the Memphis Sand increased from approximately 72 million gallons per day ("MGD") to 162 MGD. Wiley Report at 6 and Table 1.	**Response**: No. 59 is disputed because Table 1's accuracy is disputed generally. *See* Wiley Dep. 59:13-61:6.
P60	Since 2000, MLGW has decreased its rate of pumping from some of its well fields, but has not reduced the total volume being pumped from its well fields that are located near the Mississippi-Tennessee border (Davis, Palmer, Lichterman). *Id*. at Table 1.	**Objection**: Defendants object to No. 60 because the term "near the Mississippi-Tennessee border" is undefined, vague, and ambiguous. **Response**: Subject to and without waiving Defendants' objection, it is undisputed that, since

		2000, MLGW has decreased its rate of pumping from some of its well fields. The remainder of No. 60 is disputed. Wiley Dep. 59:13-61:6, Ex. 10.
P61	The Memphis Sand has been pumped by MLGW at a higher rate than it can be naturally recharged based on its geology. *Id*. at 6.	**Response**: No. 61 is disputed. Wiley Dep. 59:13-61:6; Larson Dep. Ex. 2, at 9.
P62	As a direct result of MLGW's water well development and pumping operations, the natural static head pressure within the Memphis Sand and the Sparta Sand has been dramatically drawn down by MLGW's pumping creating a cone of depression in aquifer pressures acting as a funnel crossing the Mississippi-Tennessee border and covering substantially all of Desoto County, Mississippi. *Id*.; Deposition of Brian Waldron (September 27, 2017) ("Waldron Dep.") at 97-98, 150-151.	**Objection**: Defendants object to No. 62 because the term "dramatically drawn down" is argumentative, as well as undefined, vague, and ambiguous. The Case Mgmt. Order requires these submissions to set forth "facts." Argumentative statements are inappropriate in statements of material facts. *See*, *e.g.*, *Moreno v. Serco Inc.*, No. 1:15-cv-3382-CC-JKL, 2017 WL 4334245, at *2 (N.D. Ga. Apr. 14, 2017), *report and recommendation adopted*, No. 1:15-CV-3382-CC, 2017 WL 4456891 (N.D. Ga. June 28, 2017); *Epstein v. Kemper Ins. Cos.*, 210 F. Supp. 2d 308, 314 (S.D.N.Y. 2002); *De v. City of Chicago*, 912 F. Supp. 2d 709, 713 (N.D. Ill. 2012). **Response**: Subject to and without waiving Defendants' objections, No. 62 is disputed. First, Plaintiff's citation does not support the claim that the cone of depression is "acting as a funnel" or that the cone of depression covers substantially all of DeSoto County, Mississippi. *See* Waldron Dep. 97-98, 150-151. Second, the interstate cone of depression is the

		cumulative result of pumping by all of the entities and individuals in northwest Mississippi and southwest Tennessee that withdraw groundwater from the Memphis-Sparta Aquifer, not just MLGW. Wiley Dep. 86:6-16, 87:21-88:1. Defendants do not dispute that there is a cone of depression in the Memphis-Sparta Aquifer that extends beneath parts of southwest Tennessee and northwest Mississippi. Waldron Dep. 155:9-156:20.
P63	The area in which the MLGW wells have drawn down the groundwater pressure and changed the hydraulic gradient to draw groundwater out of Mississippi into Tennessee is the area of influence of the MLGW wells—also described in groundwater movement terms as a "cone of depression." Wiley Report at 6; Waldron Dep. at 84.	**Objection**: Defendants object to No. 63 if the phrase "to draw groundwater" is intended to be a legal conclusion. Defendants adopt and incorporate the authority cited in their Objection to No. 10. Defendants further object to No. 63 if "to draw groundwater" is intended to be a factual assertion about MLGW's motive or intent, because it lacks any basis in the record. *See generally* Wiley Dep. Ex. 1 (never uses the word "drive" or any variation thereof); Spruill Dep. Ex 1 (same). **Response**: Subject to and without waiving Defendants' objections, No. 63 is disputed. Defendants do not dispute that "area of influence" and "cone of depression" are terms used to describe an area in which potentiometric head has been drawn down and the hydraulic gradient changed as the result of pumping. Further, Defendants do not dispute that

		there is a cone of depression in the Memphis-Sparta Aquifer that extends beneath southwest Tennessee and northwest Mississippi that is the cumulative result of pumping throughout the area. Wiley Dep. 86:6-16, 87:21-88:1; Waldron Dep. 155:9-156:20. However, Defendants dispute that MLGW wells have acted "to draw groundwater out of Mississippi into Tennessee." Wiley Dep. 18:2-19:6; Spruill Dep. 32:9-12, 125:10-13.
P64	MLGW's mechanical pumping pulls groundwater residing in the Sparta Sand in Mississippi into Tennessee from within Mississippi in a northward direction, altering the groundwater's natural east-to-west flow path within Mississippi. Wiley Report at 6; Spruill Rebuttal at 16.	**Objection**: Defendants object to No. 64 because the term "residing" is undefined, vague, and ambiguous. **Response**: Subject to and without waiving Defendants' objection, No. 64 is disputed. First, under pre-development conditions, the flow of groundwater in the Memphis-Sparta Aquifer in north Mississippi had a northward component near the Mississippi-Tennessee border, and naturally moved from Mississippi into Tennessee. Spruill Dep. 142:8-16, Ex. 1, at 2, 36, Figure 17; Wiley Dep. 14:18-15:14, 71:18-21, Ex. 1, Figures 9, 23, Ex. 2, Figure 5; Langseth Dep. Ex. 1, § 3.2.2.1, at 17, Ex. 4, Figure 3.2.5b. Second, any alteration of the groundwater's natural flow direction in the northwest Mississippi-southwest Tennessee area is the result of the cumulative change in potentiometric head caused by

		pumping in *both* states out of the Memphis-Sparta Aquifer. Wiley Dep. 86:6-16, 87:21-88:1.
P65	MLGW's mechanical pumping pulls groundwater residing in the confined Sparta Sand in Mississippi into Tennessee from within Mississippi at an accelerated velocity substantially in excess of the groundwater's natural flow rate of about an inch a day. Wiley Rebuttal at 4-5; Spruill Rebuttal at 16.	**Objection**: Defendants object to No. 65 because the terms "residing" and "substantially in excess" are undefined, vague, and ambiguous. **Response**: Subject to and without waiving Defendants' objection, No. 65 is disputed. Defendants do not dispute that some groundwater in the Memphis-Sparta Aquifer currently flows at a greater speed compared to the pre-development flow rate, particularly near the pumps, but disputes that all groundwater in the Memphis-Sparta Aquifer is flowing faster than it was during pre-development conditions. However, any change in groundwater velocity in the northwest Mississippi-southwest Tennessee area is the result of the cumulative change in potentiometric head caused by pumping from the Memphis-Sparta Aquifer by wells in both states, not just MLGW pumping. Wiley Dep. 86:6-16, 87:21-88:1. Further, No. 65 is not supported by Plaintiff's citation to the record, which indicates significant overlap in the flow rate between pre development times and 2007. Wiley Dep. Ex. 2, at 4-5 (opining that pre development velocity was 13-53 feet per year and is currently 8-214 feet per year, indicating that some groundwater is moving slower and/or within the same

		range as in pre development times). Finally, Plaintiff and Plaintiff's expert has asserted the speed of groundwater to be other than "about an inch a day."
P66	Through its water well development and mechanical pumping operations, MLGW has forcibly drawn into Tennessee hundreds of billions of gallons of groundwater that was stored and naturally resided in the Sparta Sand formation in Mississippi for thousands of years before MLGW's pumping. Wiley Report at 14-18.	**Objection**: Defendants object to No. 66 because the term "resided" is undefined, vague, and ambiguous. Defendants further object to No. 66 because the term "forcibly drawn" does not appear in the cited authority and is argumentative. *See* Responses to Nos. 1 and 62, *supra*. *See generally* Wiley Dep. Ex. 1 (report never uses the words "forcibly" or "drawn" or any variation thereof). **Response**: Subject to and without waiving Defendants' objections, No. 66 is disputed. First, MLGW has not "drawn" water from Mississippi; rather, MLGW's wells are located entirely within Tennessee. Wiley Dep. 18:8-19; Spruill Dep. 32:9-12. Second, the post-development movement of groundwater in the northwest Mississippi-southwest Tennessee area is the result of the cumulative change in potentiometric head caused by pumping from the Memphis-Sparta Aquifer in both states. Wiley Dep. 86:6-16, 87:21-88:1. Third, No. 66 is disputed with respect to the phrase "hundreds of billions of gallons" because Plaintiff's experts have conceded that the calculations in the cited authority are unreliable.

		Wiley Dep. 59:13-61:6, 61:15-17, 107:3-110:7, Ex. 1, Table 3, Ex. 6, Table 3.
P67	MLGW's mechanical pumping presently draws approximately 21 million gallons of groundwater each day, or 7.6 billion gallons annually, from groundwater storage within Mississippi's sovereign territory into Tennessee for sale by MLGW. Wiley Report at 17-18, 20.	**Response**: No. 67 is disputed. First, with respect to the volumetric averments, Plaintiff's experts have conceded that the calculations in the cited authority are unreliable. Wiley Dep. 59:13-61:6, 61:15-17, 107:3-110:7, Ex. 1, Table 3, Ex. 6, Table 3. Second, MLGW does not "draw" water from Mississippi; rather, MLGW's wells are located entirely within Tennessee. Wiley Dep. 18:8-19. Third, the post-development movement of groundwater in the northwest Mississippi-southwest Tennessee area is the result of the cumulative change in potentiometric head caused by pumping from the Memphis-Sparta Aquifer by wells in both states. Wiley Dep. 86:6-16, 87:21-88:1. Fourth, Defendants dispute No. 67 because, even if it was an accurate estimate of the cross-border flow, not all groundwater that moves from Mississippi into Tennessee is pumped or sold by MLGW. Langseth & Robertson 2007 Report, § 3.3, at 16-17, Figure 3-5; Waldron Dep. 156:3-20.
P68	The groundwater pumped by MLGW in Shelby County from the Memphis Sand is, on average, 2,000-3,000 years old.	**Stipulated.** *See* Section III, Fact S15.
P69	The groundwater forcibly drawn from underneath Mississippi into Tennessee by MLGW is a limited	**Objection**: Defendants object to No. 69 because the term "resided" is undefined, vague, and ambiguous,

	natural resource which originated in Mississippi and was naturally stored and resided in Mississippi for thousands of years. Wiley Report at 9-11; Wiley Rebuttal at 4.	and because it is argumentative. *See* Response to No. 62, *supra*. Defendants further object that the description of the groundwater as a "limited natural resource" is a legal conclusion. Defendants adopt and incorporate the authority cited in their Objection to No. 10. **Response**: Subject to and without waiving their objections, No. 69 is disputed. First, the term "forcibly drawn" does not appear in the cited authority. *See* Response to No. 62, *supra*. Second, MLGW has not "drawn" water from Mississippi; rather, MLGW's wells are located entirely within Tennessee. Wiley Dep. 18:8-19. Third, the Memphis-Sparta Aquifer is not a "limited natural resource." Wiley 2007 Dep. 90:8-21; Wiley Dep. 101:22-24. Fourth, under pre development conditions, some groundwater in the Memphis-Sparta Aquifer beneath Mississippi naturally moved north/northwest into Tennessee. Spruill Dep. 142:8-16, Ex. 1, at 2, 36, Figure 17; Wiley Dep. 14:18-15:14, 71:18-21, 73:3-19, 96:19-23, 141:6-142:9, 163:22-164:7, Ex. 1, Figures 9, 23, Ex. 2, Figure 5; Langseth Dep. Ex. 1, §§ 3.2.2.1, 3.2.2.2, 3.2.2.3, 3.3, at 17-20, Ex. 4, Figures 3.2.1a, 3.2.1b, 3.2.3, 3.2.4a, 3.2.4b, 3.3.1a, 3.3.1b, 3.3.2, 3.3.2b; Gentry 2007 Dep. 165:12-16. Fifth, Mississippi's expert admitted that the change in storage in the Memphis-Sparta Aquifer beneath

		Mississippi as a result of all pumping in the northwest Mississippi-southwest Tennessee area is "insignificant." Wiley 2007 Dep. 90:8-21; *see* Wiley Dep. 101:22-24. Sixth, because Defendants cannot determine what groundwater No. 69 is discussing, Defendants cannot determine the length of time it may have been in Mississippi.
P70	The groundwater would have, in the absence of MLGW's pumping, remained in Mississippi for centuries and never moved into, resided in, and been available within Tennessee. Wiley Report at 9-11; Wiley Rebuttal at 4.	**Objection**: Defendants object to No. 70 because the terms "resided" and "the groundwater" are undefined, vague, and ambiguous. Assuming that "the groundwater" refers to the groundwater that is the subject of No. 69, Defendants cannot determine exactly what groundwater is referenced because Plaintiff's citations do not support the assertion that any groundwater was "forcibly drawn." *See* Response to No. 69, *supra*. **Response**: Subject to and without waiving Defendants' objections, No. 70 is disputed. Some groundwater in the Memphis-Sparta Aquifer naturally moved from Mississippi to Tennessee under pre-development conditions. Waldron Dep. Ex. 1, at 25-26; Spruill Dep. 142:8-16, Ex. 1, at 36, Figure 17; Wiley Dep. 14:18-15:14, 71:18-21, Ex. 1, Figures 9, 23, Ex. 2, Figure 5; Langseth Dep. Ex. 1, § 3.2.2.1, at 17. Further, all groundwater in the Memphis-Sparta Aquifer flowing through Mississippi that is not

		withdrawn by pumps in Mississippi will ultimately leave Mississippi. Langseth Dep. Ex. 1, § 3.6, at 23-24. However, Defendants do not dispute that some groundwater entering the Memphis-Sparta Aquifer in Mississippi would not have moved into Tennessee under pre-development conditions.
P71	The movement of this groundwater across the Mississippi-Tennessee border is not the result of natural conditions but the result of MLGW's artificial, mechanical pumping. Wiley Report at 9-11.	**Objection**: Defendants object to No. 71 because the term "this groundwater" is undefined, vague, and ambiguous. Assuming that "this groundwater" refers to the groundwater that is the subject of No. 69, Defendants cannot determine exactly what groundwater is referenced because Plaintiff's citations do not support the assertion that any groundwater was "forcibly drawn." *See* Response to No. 69, *supra*. **Response**: Subject to and without waiving Defendants' objections, No. 71 is disputed because post-development changes in the water flow in the northwest Mississippi-southwest Tennessee area are the result of the cumulative change in potentiometric head caused by pumping out of the Memphis-Sparta Aquifer in both Tennessee and Mississippi. Wiley Dep. 86:6-16, 87:21-88:1. However, Defendants state that it is undisputed that under pre-development conditions some groundwater in the Memphis-Sparta Aquifer naturally moved across the Mississippi-Tennessee border. Spruill Dep. 142:8-16, Ex. 1, at 36,

		Figure 17; Wiley Dep. 14:18-15:14, 71:18-21, Ex. 1, Figures 9, 23, Ex. 2, Figure 5; Langseth Dep. Ex. 1, § 3.2, at 16-20.
P72	MLGW's excessive pumping has caused the groundwater storage and pressures in the Sparta Sand formation in north Mississippi to be drawn down dramatically, as the groundwater is being drawn down more rapidly than the Sparta Sand in north Mississippi can be recharged or replenished. Wiley Report at 19.	**Objection**: Defendants object to No. 72 because it is argumentative. *See* Response to No. 62, *supra*. **Response**: Subject to and without waiving Defendants' objection, No. 72 is disputed. First, Plaintiff's record citation provides no support for the assertion that MLGW's pumping is "excessive" or that pressures have been drawn down "dramatically." *See* Response to No. 62, *supra*. Second, the Memphis-Sparta Aquifer in the northwest Mississippi-southwest Tennessee area is not being drawn down more rapidly than it can be recharged. Wiley Dep. 61:20-63:16; Larson Dep. Ex. 2, at 9. Third, any draw down of pressures in the Memphis-Sparta Aquifer in the northwest Mississippi-southwest Tennessee area is the result of the cumulative change in potentiometric head caused by pumping from the Memphis-Sparta Aquifer by wells in both Tennessee and Mississippi. Wiley Dep. 86:6-16, 87:21-88:1. Fourth, Mississippi's expert admitted that the change in storage in the Memphis-Sparta Aquifer beneath Mississippi as a result of all pumping in the northwest Mississippi-southwest Tennessee area is

		"insignificant." Wiley 2007 Dep. 90:8-21; *see* Wiley Dep. 100:8-18.
P73	MLGW's excessive pumping has decreased the total amount of groundwater in the Sparta Sand available for development in Mississippi and increased the costs of recovering the remaining available groundwater from the Sparta Sand within the area of depressurization (cone of depression). Spruill Rebuttal at 3.	**Objection**: Defendants object to No. 73 because the term "excessive" is argumentative. *See* Response to No. 62, *supra*. **Response**: Subject to and without waiving Defendants' objection, No. 73 is disputed. Any change to the total amount of groundwater in the Memphis-Sparta Aquifer is not attributable solely to MLGW's pumping. Wiley Dep. 86:6-16. Second, Mississippi's expert admitted that he has "not done any calculations" about "how much the economics" of "producing that water" "have been impacted." Spruill Dep. 91:15-24.
P74	The substantial drawdown of natural groundwater pressures in the Sparta Sand within Mississippi caused by MLGW's pumping has reduced the total available groundwater for safe production in Mississippi for the benefit of its citizens in the future. Spruill Report at 29; Spruill Rebuttal at 3.	**Objection**: Defendants object to No. 74 because the terms "substantial" and "safe" are undefined, vague, and ambiguous. Defendants further object to Mississippi's characterization of the water as for the benefit of its citizens in the future as legal argument. Defendants adopt and incorporate the authority cited in their Objection to No. 10. **Response**: Subject to and without waiving Defendants' objections, No. 74 is disputed. First, the Memphis-Sparta Aquifer in the northwest Mississippi-southwest Tennessee area is not being drawn down more rapidly than it can be recharged.

		Wiley Dep. 61:20-63:16. Second, any draw down of pressures in the Memphis-Sparta Aquifer in the northwest Mississippi-southwest Tennessee area is the result of the cumulative change in potentiometric head caused by pumping from the Memphis-Sparta Aquifer by wells in both states. Wiley Dep. 86:6-16, 87:21-88:1. Third, any change in the availability of groundwater in northwest Mississippi is the cumulative effect of pumping in Mississippi and Tennessee. Wiley Dep. 61:20-63:16. Fourth, Mississippi's expert admitted that the change in storage in the Memphis-Sparta Aquifer beneath Mississippi as a result of all pumping in the northwest Mississippi-southwest Tennessee area is "insignificant." Wiley 2007 Dep. 90:8-21; *see* Wiley Dep. 101:22-24.
P75	The substantial drawdown of natural groundwater pressures caused by MLGW's pumping has materially impacted the availability of naturally-occurring groundwater throughout the cone of depression by converting the Mississippi alluvial aquifer from an aquifer recharged by Sparta Sand discharge under natural conditions into a source of groundwater recharge for the Sparta Sand. Spruill Report at 23-24.	**Objection**: Defendants object to No. 75 because the terms "substantial drawdown" and "materially impacted" are undefined, vague, and ambiguous. **Response**: Subject to and without waiving Defendants' objection, No. 75 is disputed. First, Plaintiff has cited no factual support for its claim that there has been a substantial drawdown of natural groundwater pressures in the Sparta Sand within Mississippi. Second, any drawdown of the Memphis-Sparta Aquifer in the northwest Mississippi-southwest

		Tennessee area (along with any resulting hydrological effects) is the cumulative result of pumping in both Mississippi and Tennessee. Wiley Dep. 86:6-16, 87:21-88:1. For further response, Defendants do not dispute that, in some areas, the alluvial aquifer received recharge from the Memphis-Sparta Aquifer under pre-development conditions and that, in some areas, the alluvial aquifer recharges the Memphis-Sparta Aquifer now.
P76	The excessive MLGW pumping creating the massive cone of depression in Tennessee and Mississippi puts the naturally occurring high quality groundwater in the Sparta Sand at risk because it induces lower pressures in the Sparta Sand than exist in overlying aquifers from which lower quality water may be drawn through paleochannels or other breaches in the overlying Middle Claiborne confining layer. Such breaches have already occurred in MLGW's well fields. Spruill Report at 23-24; Waldron Dep. at 70-75.	**Objection**: Defendants object to No. 76 because it is a legal conclusion. Defendants adopt and incorporate the authority cited in their Objection to No. 10. Defendants further object to No. 76 because it erroneously implies that paleochannels (or breaches) were caused by pumping. Waldron Dep. 75:16-76:4. **Response**: Subject to and without waiving their objections, Defendants state that No. 76 is a legal argument, and, therefore, no answer is required. However, for further response, Defendants do not dispute that the lower pressure in the Memphis-Sparta Sand may cause water to flow from the alluvial aquifer into the Memphis-Sparta Aquifer through naturally occurring paleochannels or other breaches in the confining layer.

P77	MLGW has knowingly developed and increased its pumping to appropriate high quality groundwater naturally residing within Mississippi's sovereign territory for the economic benefit of Memphis without Mississippi's permission or payment of compensation to Mississippi for at least 50 years. MS SCT 00687 and 002134.	**Objection:** Defendants object to No. 77 because it is a legal conclusion. Defendants adopt and incorporate the authority cited in their Objection to No. 10. **Response:** Subject to and without waiving their objection, Defendants state that No. 77 is a legal argument, and, therefore, no response is required.
P78	A report published by the United States Geological Survey in 1964 in cooperation with the City of Memphis, Memphis Light, Gas, and Water Division, reported that at that time MLGW had five well fields pumping from the Memphis Sand. J. H. Criner, P-C. P. Sun, and D. J. Nyman, Hydrology of Aquifer Systems in the Memphis Area, Tennessee, MS SCT 00687 at 07 ("1964 USGS Report").	**Stipulated.** *See* Section III, Fact S16.
P79	The 1964 USGS Report concluded that groundwater withdrawals from the Memphis Sand (a/k/a "500-foot" sand) for municipal and industrial use in the Memphis area had increased from about 68 MGD in 1935, the first year for which records were available, to about 135 MGD in 1960; and that these increased withdrawals had significantly drawn down the natural pressures in the aquifer, creating a major cone of depression under the City of Memphis. *Id*. at 018-19.	**Response:** No. 79 is disputed because it does not accurately characterize the conclusion of the 1964 USGS Report.

P80	The 1964 USGS Report concluded: "Increases in the annual rate of withdrawal have accelerated the lowering of the piezometric surface [pressure] in the entire Memphis area so that the hydraulic gradient (slope of the water or pressure surface) is continually steeping. Consequently, larger amounts of water are transmitted into the area to supply the increased withdrawal . . . . As the rate of withdrawal increases, the regional cone of depression is expanded and deepened." *Id.* at 016.	**Response**: It is undisputed that the quoted language appears in the cited authority. However, No. 80 is disputed to the extent it characterizes the quoted language as a conclusion.
P81	The 1964 USGS Report concluded that of the groundwater pumped in the Memphis area from the Memphis Sand in 1960, 25 MGD (million gallons a day) was coming from the State of Mississippi. *Id*. at 032.	**Response**: No. 81 is disputed. The cited authority finds that 25 MGD of groundwater came "[a]cross [the] southern boundary" of the "Memphis area." Criner et al., *Hydrology of Aquifer Systems* at O32; *see id*. at O3, Figure 1 (defining the "Memphis area" as including portions of north Mississippi and east Arkansas, in addition to Shelby County, Tennessee).
P82	The 1964 USGS Report concluded that: "If the annual pumping rate from the '500-foot' sand continues to increase at the present rate of approximately 5 MGD per year, water levels will decline at about the same rate as at present unless future wells and well fields are located at greater distances from the present centers of pumping." *Id*. at 047.	**Response**: It is undisputed that the quoted language appears in the cited authority. However, No. 82 is disputed to the extent it characterizes the quoted language as a conclusion.
P83	The 1964 USGS Report concluded that more water was being taken from the Memphis Sand than was	**Response**: No. 83 is disputed. First, the cited authority does not support No. 83. Criner et al.,

	being replaced each year because of the annual increase in pumping. *Id*. at 048.	*Hydrology of Aquifer Systems* at O48 (referring to pumping in all underground sources of water including the Memphis-Sparta Aquifer and Fort Pillow Aquifer). Second, in the northwest Mississippi-southwest Tennessee area, more water is not being withdrawn from the Memphis-Sparta Aquifer than is being replaced. Wiley Dep. 61:20-63:16. Third, No. 83 is disputed to the extent it characterizes the statement as a conclusion.
P84	The 1964 USGS Report concluded: "The preferable direction for the establishment of new well fields in the '500-foot' sand is unknown, although the southeastern part of the area is indicated because the greater rate of inflow is from that direction." *Id*. at 049.	**Response**: It is undisputed that the quoted language appears in the cited authority. However, No. 84 is disputed to the extent it characterizes the quoted language as a conclusion.
P85	A report published by the United States Geological Survey in 1965 in cooperation with the Tennessee Department of Conservation's Division of Water Resources, concluded that under conditions of heavy pumping in Memphis, 25 MGD had been diverted from Mississippi into Shelby County in 1960. G. K. Moore, Geology and Hydrology or the Claiborne Group in Western Tennessee, MS SCT 002134 at F28 ("1965 USGS Report").	**Response**: No. 85 is disputed. The underlying authority finds that 25 MGD came "[a]cross [the] southern boundary" of the "Memphis area." Criner et al., *Hydrology of Aquifer Systems* at O32; *see id.* at O3, Figure 1. Defendants also adopt and incorporate by reference their Response to No. 81.
P86	The 1965 USGS Report advised that the anticipated effects of additional large scale development in western Tennessee would include a drop in local and	**Response**: Defendants dispute No. 86 because it is materially incomplete and misleading. For example, the 1965 USGS Report also advises that "[t]he

	regional water levels in proportion to the increase in pumpage, and an increase in the net inflow of groundwater from adjacent States. *Id*. at F2.	quantities of water available to wells from the '500-foot' sand are currently adequate for all municipal and industrial needs," Moore, *Geology and Hydrology* at F1, and "[g]round-water supplies in both the '500-foot' sand and the unnamed sand unit will be adequate for the predicted rate of municipal growth and economic development for many years to come," *id*. at F2. Further, the "western Tennessee" area discussed in the USGS Report is the entire west Tennessee area from Mississippi to the south, Kentucky to the north, the Mississippi River to the west, and the easternmost extent of the Middle Claiborne Group in Tennessee to the east—not Shelby County alone. *Id*.
P87	The 1965 USGS Report concluded that "future development [of the Memphis Sand and an "unnamed sand unit"] should be undertaken with the full knowledge that the net increase in pumpage will be offset by an increase in the inflow of groundwater from other States." *Id*. at F41.	**Response**: No. 87 is disputed. Defendants dispute No. 87 because it is materially incomplete and misleading. The USGS Report states in full context: Thus, ground-water supplies in both the "500-foot" sand and the unnamed sand unit will be adequate for the predicted rate of municipal growth and economic development for many years to come. Future development should be undertaken with the full knowledge that the net increase in pumpage will be offset by an increase in

		the inflow of ground water from other States, a decrease in the base flow of streams crossing the outcrop area of the Claiborne aquifers, or both. Moore, *Geology and Hydrology* at F41. The USGS Report actually concludes that, "[a]lthough new wells are continually being developed in western Tennessee, the ground-water supply from the aquifers in the Claiborne Group will be adequate to supply the needs of the water users within the report area for many years to come." *Id.* at F42. Finally, the area of "future development" discussed in the USGS Report is the entire west Tennessee area from Mississippi to the south, Kentucky to the north, the Mississippi River to the west, and the easternmost extent of the Middle Claiborne Group in Tennessee to the east—not Shelby County. *Id.* at F2.
P88	Subsequent to the 1964 USGS Report, MLGW developed and began producing groundwater from its Lichterman well field, in which most of the wells are located within two to three miles of the Mississippi-Tennessee border. Subsequent to the 1965 USGS Report, MLGW developed and began producing groundwater from the Davis and Palmer well fields, in which all of the wells are located within two to	**Response**: No. 88 is disputed. First, the cited authority does not support No. 88. Wiley Dep. Ex. 1, at 5-6. Second, since 1965, there have been only 4 new MLGW well fields. Wiley Dep. Ex. 10. Third, the Lichterman well field was in service by 1965. *Id.* For further response, Defendants adopt and incorporate by reference their Response to No. 57, *supra*.

	three miles of the Mississippi-Tennessee border. Wiley Report at 5-6 and Table 1.	
P89	At the time MLGW designed and developed the Lichterman, Davis and Palmer well fields within Tennessee near the Mississippi border it did so with full knowledge that it would forcibly redirect and draw confined groundwater that was naturally residing within Mississippi out of Mississippi into Tennessee by artificial, mechanical means. MS SCT 00687 at 016, 032, 047-49; MS SCT 002134 at F2, F28, F41.	**Objection**: Defendants object to No. 89 because the phrase "forcibly redirect and draw" is undefined, vague, and ambiguous. Defendants object to No. 89 because the term "forcibly redirect" is argumentative. *See* Response to No. 62, *supra*. **Response**: Subject to and without waiving Defendants' objections, No. 89 is disputed because the cited authority does not support No. 89.
P90	Multiple federal and state groundwater scientists, including experts from the United States Geological Survey ("USGS"), from the University of Memphis Ground Water Institute ("GWI"), and from the State of Tennessee have reported MLGW's huge extractions of groundwater from Mississippi into Tennessee by unregulated pumping in Tennessee, and the massive cone of depression within Mississippi created by that pumping. Randall W. Gentry Deposition (August 7, 2006) ("Gentry Dep.") at 10, 14-15, 20-24, 28-43, 77-79, 130-31, 138-41 and Exhibits 2, 3 and 4; J. Kerry Arthur and Richard E. Taylor, Ground-Water Flow Analysis of the Mississippi Embayment Aquifer System, South-Central United States, MS SCT 000030-31; J. V. Brahana and R.E. Broshears, Hydrogeology and	**Objection**: Defendants object to No. 90 because the terms "huge extractions" and "massive cone of depression" are argumentative, as well as undefined, vague, and ambiguous. *See* Response to Nos. 62 and 89, *supra*. **Response**: Subject to and without waiving their objections, Defendants state that No. 90 is disputed because the cited authority does not support the statement in No. 90.

	Ground-Water Flow in the Memphis and Fort Pillow Aquifers in the Memphis Area, Tennessee, MS SCT 000305-08; J.V. Brahana, Digital Ground-Water Model of the Memphis Sand and Equivalent Units, Tennessee-Arkansas-Memphis, MS SCT 000414; James H. Criner and William S. Parks, Historic Water-Level Changes and Pumpage from the Principal Aquifers of the Memphis Area, Tennessee: 1886-1975, MS SCT 000640; J.H. Criner, P-C. P. Sun, and D. J. Nyman, Hydrology of Aquifer Systems in the Memphis Area, Tennessee, MS SCT 000692, 000706-18; David Feldman and Julia O. Elmendorf, Final Report: Water Supply Challenges Facing Tennessee: Case Study Analyses and the Need for Long-Term Planning, MS SCT 000991, 001033, 0001037.	
P91	These scientific publications confirm that MLGW has not only mechanically extracted billions of gallons of groundwater residing in Mississippi, but has, for all practical purposes, permanently altered the natural flow direction, rate of flow, and recharge patterns within the Sparta Sand formation in north Mississippi. *Id*. as to all citations in Statement No. 90.	**Response**: No. 91 is disputed. First, USGS reports show rapid recovery of water levels in an observation well after pumping stops. Michael Bradley, Jack Carmichael & Jim Kingsbury, USGS, *Groundwater Network and Water-level Response in the Memphis Area* 9 (June 23, 2015). Second, any alterations of the natural flow paths and recharge patterns in the Memphis-Sparta Aquifer in the north Mississippi-southwest Tennessee area are the cumulative result of changes in potentiometric head caused by the collective groundwater pumping in both states. Wiley

		Dep. 86:6-16, 87:21-88:1. Third, the cited authority does not support the statement in No. 91.
P92	Before the development of massive groundwater water pumping from the Middle Claiborne aquifer in Shelby County, Tennessee, in the twentieth century, Tennessee could have developed the high quality groundwater in the Middle Claiborne aquifer with minimal impact in Mississippi while protecting the aquifer on a long term sustainable basis. Spruill Dep. at 126-40 and 237-38.	**Objection**: Defendants object to No. 92 because the term "massive" is argumentative, as well as undefined, vague, and ambiguous. *See* Response to No. 62, *supra*. **Response**: Subject to and without waiving Defendants' objection, No. 92 is disputed. First, Mississippi's expert admitted in his deposition that he had no factual support for the averment in No. 92 and/or that his assumptions were inaccurate. Spruill Dep. 132:17-133:11, 140:2-5, 237:3-238:3. Second, the majority of the cited authority does not even address the asserted statement. Spruill Dep. 126:1-129:23, 133:17-140:16. Third, No. 92 is inconsistent with Mississippi's expert David Wiley. Fourth, see Langseth & Robertson 2007 Report, § 4, at 22.
P93	Memphis and MLGW's public utility water needs could have been, and can still be, met without MLGW's draw of groundwater out of Mississippi's sovereign territory into Tennessee. Available options include (a) locating MLGW's water wells to the north and east of MLGW's distribution system, (b) requiring greater spacing between MLGW's wells, (c) alternatively pumping water from MLGW's wells on a planned schedule that ceases	**Response**: No. 93 is disputed. First, MLGW does not "draw" water from Mississippi; rather, MLGW's wells are located entirely within Tennessee. Wiley Dep. 18:8-19. Second, Mississippi's expert admitted in his deposition that he had no factual support for the averment in No. 93. Spruill Dep. 132:17-133:16, 140:2-5, 237:3-238:3. The costs of locating the wells to the north and east of MLGW's distribution system or using treated Mississippi River or other surface

	pumping from specified wells on a schedule designed to reduce the impact, and/or (d) using treated Mississippi River or other surface water as an alternate or supplemental source of water supply. Spruill Dep. at 126-31; Waldron Dep. at 156-57.	water as an alternate or supplemental source of water supply would be "enormous." Wiley Memorandum to File (May 25, 2007).
P94	MLGW's actions are not consistent with good groundwater management practices and have denied Mississippi of the ability to effectively manage and utilize groundwater located within Mississippi's borders. Spruill Report at 3; Spruill Dep. at 127-40.	**Objection**: Defendants object to No. 94 because the term "good groundwater management practices" is argumentative, as well as undefined, vague, and ambiguous. *See* Response to No. 62, *supra*. **Response**: Subject to and without waiving Defendants' objection, No. 94 is disputed. Langseth & Robertson 2007 Report, § 3.2, at 14-15. Mississippi's expert admitted in his deposition that he had no factual support for the averment in No. 94. Spruill Dep. 132:17-133:11, 140:2-16, 237:3-238:3.
P100	Tennessee has taken no steps to preclude any persons or entities in Tennessee from pumping groundwater out of the State of Mississippi that would not be available in Tennessee under natural conditions.	**Objection:** Defendants object to No. 100 because Mississippi cites no authority to support the statement as is required by the Case Mgmt. Order. Defendants further object to No. 100 because it is a legal conclusion. Defendants adopt and incorporate the authority cited in their Objection to No. 10. **Response:** Subject to and without waiving their objections, Defendants state that No. 100 is a legal argument, and, therefore, no response is required. For further response, Defendants state that Defendants do

		not pump groundwater out of Mississippi. Wiley Dep. 18:8-19.
P102	The protection and conservation of groundwater can best be accomplished by preserving the authority of each State to exclusively hold, regulate, and control the withdrawal of groundwater naturally residing within its borders. MS SCT 015634-61; Spruill Report at 3, 7, 9, 11-17; 23-29; U.S. Geological Survey Professional Paper 1416-I, Ground-Water Flow Analysis of the Mississippi Embayment Aquifer System, South-Central United States (1998) (MS SCT 002966) at I1; Spruill Rebuttal at 2-4, 16, 24-25, 37; Wiley Report at 5-7, 9-11, 14-20, Table 1; MS SCT 002966 at Figure 5; Wiley Rebuttal at 4-5, Figure 1; Spruill Dep. at 126-140, 142-144, 237-238; Waldron Dep. at 66-68, 70-75, 84, 95, 97-98, 119-21, 150-151; 1964 USGS Report at 07, 016, 018-019, 032, 047-049; 1965 USGS Report at F2, F28, F41; Gentry Dep. at 10, 14-15, 20-24, 28-43, 77-79, 130-31, 138-41 and Exhibits 2, 3 and 4; MERGWS at 7-9; J. Kerry Arthur and Richard E. Taylor, Ground-Water Flow Analysis of the Mississippi Embayment	**Objection:** Defendants object to No. 102 because it is a legal conclusion. Defendants adopt and incorporate the authority cited in their Objection to No. 10. **Response:** Subject to and without waiving their objections, Defendants state that No. 102 is a legal argument, and, therefore, no response is required. For further response, see Crawford 2007 Dep. 133:10-20, 138:13-139:1; Branch[11] 2007 Dep. 45:1-46:19; Gentry 2007 Dep. 145:3-146:12; Hoffman 2007 Dep. 43:3-18. *See also* Christine A. Klein, *Owning Groundwater: The Example of Mississippi v. Tennessee*, 35 Va. Envtl. L.J. 474, 478-79 (2017). Further, Defendants dispute No. 102 because the cited authority does not support the averment in No. 102.

[11] Charles Thomas Branch, formerly the Director of the Office of Land and Water Resources of the Mississippi Department of Environmental Quality, gave deposition testimony in the federal district court lawsuit on October 1, 2007.

	Aquifer System, South-Central United States, MS SCT 000030-31; J. V. Brahana and R.E. Broshears, Hydrogeology and Ground-Water Flow in the Memphis and Fort Pillow Aquifers in the Memphis Area, Tennessee, MS SCT 000305-08; J.V. Brahana, Digital Ground-Water Model of the Memphis Sand and Equivalent Units, Tennessee-Arkansas-Memphis, MS SCT 000414; James H. Criner and William S. Parks, Historic Water-Level Changes and Pumpage from the Principal Aquifers of the Memphis Area, Tennessee: 1886-1975, MS SCT 000640; David Feldman and Julia O. Elmendorf, Final Report: Water Supply Challenges Facing Tennessee: Case Study Analyses and the Need for Long-Term Planning, MS SCT 000991, 001033, 0001037.	
P103	Recognizing groundwater residing in Mississippi as an intrastate resource as required by the United States Constitution will promote the protection and conservation of groundwater as a natural resource. *Id*. as to all record citations in Statement No. 102, above.	**Objection:** Defendants object to No. 103 because it is a legal conclusion. Defendants adopt and incorporate the authority cited in their Objection to No. 10. **Response:** Subject to and without waiving their objections, Defendants state that No. 103 is a legal argument, and, therefore, no response is required. For further response, Mississippi has repeatedly and consistently represented to the federal courts that the Memphis-Sparta Aquifer, including the groundwater

		in it, is an interstate resource. *Hood v. City of Memphis*, No. 2:05CV32-D-B (N.D. Miss.): Complaint [Dkt. No. 2, ¶¶ 9, 11]; Plaintiff's Response to Defendants' (I) Motion to Dismiss for Lack of Ripeness / Lack of Standing, (II) Motion to Dismiss for Failure to Join Indispensable Party, (III) Motion to Dismiss the Tort Claims for Lack of Subject Matter Jurisdiction / Improper Venue [Dkt. No. 29, at 4]; Reply Memorandum of Authorities in Support of Plaintiff's Response to Defendants' Motion (I) to Dismiss for Lack of Ripeness / Lack of Standing, (II) to Dismiss for Failure to Join Indispensable Party, (III) to Dismiss the Tort Claims for Lack of Subject Matter Jurisdiction / Improper Venue [Dkt. No. 32, at 3, 5, 10-11 & nn.9-11, 27 n.27]; Plaintiff's Surrebuttal Memorandum of Authorities [Dkt. No. 39, at 2-3, 8-10]; Plaintiff's Reply Memorandum of Authorities in Support of Response in Opposition to Defendants' Motion to Alter or Amend Order or Alternatively to Certify Order for Interlocutory Appeal [Dkt. No. 59, at 2 & n.2]; First Amended Complaint [Dkt. No. 112, ¶¶ 8, 46]; Plaintiff's Surreply to Defendants' Reply to Plaintiff's Response to Defendants' Motion for Judgment on the Pleadings [Dkt. No. 250, at 5, 7]. *See also Hood v. City of Memphis*, No. 08-60152 (5th Cir.): Brief for Appellant at 1, 21, 23 (May 14, 2008); Reply Brief of Appellant at 11, 15 (Aug. 1, 2008). For

		further response, Defendants adopt and incorporate by reference their Response to No. 102, *supra*.
P104	Categorizing groundwater in the confined Sparta Sand in Mississippi as an interstate resource available to Tennessee and only limited by groundwater extraction capabilities located within its borders will undermine the established authority of Mississippi under the United States Constitution to protect and preserve its natural resources, and will promote waste of this most valuable natural resource. *Id*. as to all record citations in Statement No. 102, above.	**Objection:** Defendants object to No. 104 because the purported citation to the record is overly broad and not in compliance with the Case Mgmt. Order. Defendants object to No. 104 because it is a legal conclusion. Defendants adopt and incorporate the authority cited in their Objection to No. 10. **Response:** Defendants adopt and incorporate by reference their Response to No. 102, *supra*.
P105	The equitable apportionment remedy created by the Supreme Court of the United States for naturally shared surface water flowing interstate on the path created by natural geological and environmental forces is not applicable to confined groundwater naturally residing in one state for hundreds and thousands of years, is not suitable for the protection and preservation of confined groundwater, and will not promote the protection and conservation of confined groundwater. *Id*. as to all record citations in Statement No. 102, above.	**Objection:** Defendants object to No. 105 because the purported citation to the record is overly broad and not in compliance with the Case Mgmt. Order. Defendants object to No. 105 because it is a legal conclusion. Defendants adopt and incorporate the authority cited in their Objection to No. 10. **Response:** Defendants adopt and incorporate by reference their Response to No. 103. For further response, Defendants state that Mississippi has previously sought equitable apportionment as a remedy for the same claims asserted in the present lawsuit. Compl. ¶ 5, *Mississippi v. City of Tennessee, et al.*, No. 139, Orig. (U.S. filed Sept. 2, 2009).

II. DEFENDANTS' FACTS AND PLAINTIFF'S RESPONSES

NO.	DEFENDANTS' FACTS	PLAINTIFF'S OBJECTIONS AND RESPONSES
D1	"Aquifer" means a formation, group of formations, or part of a formation that contains sufficient saturated, permeable material to yield usable quantities of water to wells and springs.	**Stipulated.** *See* Section III, Fact S17.
D2	"Cone of depression" is an area of lower potentiometric head surrounding an active pumping well that is caused by pumping (with the lowest potentiometric head being at the well).	**Stipulated.** *See* Section III, Fact S18.
D3	"Confined aquifer" or "confined area of an aquifer" is an aquifer or area of an aquifer that has an overlying confining layer and in which the pressure in the aquifer is high enough that the potentiometric head in the aquifer rises above the bottom of that confining layer.	**Stipulated.** *See* Section III, Fact S19.
D4	"Confining layer" means a formation of consolidated or unconsolidated sediments having very low hydraulic conductivity (i.e., low permeability) that restricts the movement of groundwater either into or out of adjacent aquifers.	**Stipulated.** *See* Section III, Fact S20.
D5	"Discharge" is commonly used to refer to water that moves out of an aquifer."	**Stipulated.** *See* Section III, Fact S21.

D6	"Equipotential line" means a line on a map along which the potentiometric head is estimated to be the same.	**Stipulated.** *See* Section III, Fact S22.
D7	"Flow path" or "flow line" means the average, idealized path followed by particles of water as they move through the aquifer.	**Stipulated.** *See* Section III, Fact S23.
D8	"Fort Pillow Aquifer" refers to the aquifer underlying the Memphis- Sparta Aquifer, which, in the Shelby County, Tennessee – DeSoto County, Mississippi area, is separated from the Memphis-Sparta 6 Aquifer by a confining layer; the Fort Pillow Aquifer is represented by layer 12 in the USGS Mississippi Embayment Regional Aquifer Study ("MERAS") model and layer 3 in the Brahana and Broshears model. Langseth Dep. Ex. 1, § 2.2, at 9-10, C-4, C-7; *id*. Ex. 4, Table 2.2.1; Brian R. Clark & Rheannon M. Hart, *The Mississippi Embayment Regional Aquifer Study (MERAS): Documentation of a Groundwater-Flow Model Constructed to Assess Water Availability in the Mississippi Embayment*, USGS Scientific Investigations Report 2009-5172, at 8, Table 1 (2009) (hereinafter "MERAS Report"), *available at* https://pubs.usgs.gov/sir/2009/5172/; J.V. Brahana & R.E. Broshears, *Hydrogeology and Ground-Water Flow in the Memphis and Fort Pillow Aquifers in the Memphis Area, Tennessee*, USGS Water-Resources Investigations Report 89-4131, at	**Response**: Disputed. Mississippi objects to Defendant's definition and use of the Memphis Sparta Aquifer. Mississippi also objects to this definition of the "Fort Pillow Aquifer" because it is not supported by the cited references. The Fort Pillow Sand is part of the Lower Wilcox Aquifer system, and is separated by the Flour Island Formation confining layer from the Memphis Sand in Tennessee. MERAS Report Table 1. The suggestion that the Fort Pillow is somehow naturally "hydrologically connected" is misleading. The Fort Pillow is separated from the Memphis Sand by a 140 to 310 foot clay confining layer, and head differences occur because of pumping. It is not a source of meaningful natural recharge to the Memphis Sand, it does not exist in Mississippi, and groundwater within this formation is not the subject of Mississippi's lawsuit. Brahana & Broshears Report at 13-15.

	26 (2001) (hereinafter "Brahana & Broshears Report"), *available at* https://pubs.usgs.gov/wri/wri894131/pdf/ wri89-4131.pdf.	
D9	"Mississippi Embayment" is the northern portion of the Gulf Coast regional trough in the Paleozoic rocks that has filled with sediments during subsequent geologic periods, with alternating periods of land and ocean environments. The axis of the Mississippi Embayment is generally coincident with the Mississippi River; the northern extent of the Mississippi Embayment is approximately where the Ohio River joins the Mississippi River; and the southern extent is in southern Mississippi and central Louisiana.	**Stipulated.** *See* Section III, Fact S24.
D10	"Outcrop area" is the area of an aquifer that has no confining layer above and comes close to the surface or comes to the surface. The outcrop area can function as a recharge zone.	**Stipulated.** *See* Section III, Fact S25.
D11	"Potentiometric head" is the elevation to which water rises inside a tightly cased, properly screened well at a given location in an aquifer.	**Stipulated.** *See* Section III, Fact S26.
D12	"Potentiometric surface" is a representation of the potentiometric head of an aquifer over a region and is often represented in terms of lines of equal potentiometric head, commonly called contour lines.	**Stipulated.** *See* Section III, Fact S27.

D13	"Pre-development" or "pre-development conditions" refers to the time before human influence on an aquifer—most commonly, before pumping began. For the Memphis-Sparta Aquifer in the area of southwest Tennessee and northwest Mississippi, pre-development is considered to be before 1886.	**Response**: Undisputed in part and disputed in part. Mississippi does not dispute the first sentence, and does not dispute that "pre-development" for the portions of the Memphis Sand and the portions of the Sparta Sand that are at issue in this case is considered to be before 1886. Mississippi objects, however, to Defendants' definition and use of Memphis-Sparta Aquifer.
D14	"Recharge" means water that moves into an aquifer. One example of recharge is rainfall that seeps through the ground into an aquifer.	**Stipulated.** *See* Section III, Fact S28.
D15	"Surficial aquifer" refers to the shallowest aquifer overlying the Memphis-Sparta Aquifer and separated from the Memphis-Sparta Aquifer by a confining layer; the surficial aquifer, where present, is represented by layers 1 or 3 in the USGS MERAS model and is layer 1 in the Brahana and Broshears model.	**Response**: Disputed. Mississippi objects to this definition because it is neither a direct quote of a recognized scientific definition, nor an accurate summary description. Mississippi objects to Defendant's definition of the Memphis Sparta Aquifer. "Surficial Aquifer" and "Unconfined Aquifer" are both the same: "An aquifer having a water table; an aquifer containing unconfined groundwater." William E. Wilson and John E. Moore, The American Geological Institute Glossary of Hydrology (1998)
D16	"Unconfined aquifer" or "unconfined area of an aquifer" means an aquifer or area of an aquifer in which the potentiometric head is below the overlying confining layer or in which the overlying confining layer is not present.	**Stipulated.** *See* Section III, Fact S29.

D17	The term "interstate aquifer" has been used by the USGS to describe aquifers that lie beneath at least two states. *See, e.g.*, John P. Masterson, Jason P. Pope, Michael N. Fienen, Jack Monti, Jr., Mark R. Nardi & Jason S. Finkelstein, U.S. Dep't of Interior, USGS, *Assessment of Groundwater Availability in the Northern Atlantic Coastal Plain Aquifer System From Long Island, New York, to North Carolina*, Professional Paper 1829, at 7 (2016), *available at* https://pubs.usgs.gov/pp/1829/pp1829.pdf; John P. Masterson, Jason P. Pope, Jack Monti, Jr., Mark R. Nardi, Jason S. 9 Finkelstein & Kurt J. McCoy, U.S. Dep't of Interior, USGS, *Hydrogeology and Hydrologic Conditions of the Northern Atlantic Coastal Plain Aquifer System From Long Island, New York, to North Carolina*, Scientific Investigations Report 2013-5133, at 3 (Sept. 2015), *available at* https://pubs.er.usgs.gov/publication/sir20135133; Sue C. Kahle, Rodney R. Caldwell & James R. Bartolino, U.S. Dep't of Interior, USGS, *Compilation of Geologic, Hydrologic, and Ground-Water Flow Modeling Information for the Spokane Valley-Rathdrum Prairie Aquifer, Spokane County, Washington, and Bonner and Kootenai Counties, Idaho*, Scientific Investigations Report 2005-5227, at 2 (2005), *available at* https://pubs.	**Response**: Disputed. Mississippi objects to Statement No. 17 on the grounds the statement is not supported by record citations. The statements are general, anecdotal references to geologic formations that underlie multiple states, and the "interstate" labels the publications casually attribute to those formations do not reflect an application or analysis of the term "interstate" in any technical context appropriate for this hearing as they could be read as asserting a legal conclusion on the issue before the Court. The articles also do not attempt to distinguish between (1) the specific geographic location(s) and sedimentary deposits in the specific geological formation(s), or (2) the sources, quality, location, residence time, or other important hydrologic characteristics of the groundwater stored in the formation(s) under natural conditions. The labels these articles may place on geological formations, or aquifers within them taken out of their specific context only confuse the issue before the Court.

	usgs.gov/sir/2005/5227/pdf/sir20055227.pdf; L. Elliott Jones & Lynn J. Torak, U.S. Dep't of Interior, USGS, *Simulated Effects of Impoundment of Lake Seminole on Ground-Water Flow in the Upper Floridan Aquifer in Southwestern Georgia and Adjacent Parts of Alabama and Florida*, Scientific Investigations Report 2004-5077, at 10 (2004), *available at* https://pubs.usgs.gov/sir/2004/5077/pdf/SIR 2004-5077.pdf; Joseph B. Gonthier, U.S. Dep't of Interior, USGS, *A Description of Aquifer Units in Eastern Oregon*, Water-Resources Investigations Report 84-4095, at 13 (1985), *available at* https://pubs.usgs.gov/wri/1984/4095/report.pdf; U.S. Dep't of Interior, USGS, *National Water Summary 1983—Hydrologic Events and Issues*, Water-Supply Paper 2250, at 112, 194, 203 (1984), *available at* https://pubs.er.usgs.gov/publication/wsp2250.	
D18	The term "interstate aquifer" is used by the Advisory Committee on Water Information's Subcommittee on Ground Water. *See* Advisory Comm. on Water Information, Subcomm. on Ground Water, *A National Framework for Ground-Water Monitoring in the United States* 2, 5, 58 (rev. July 2013), *available at* https://acwi.gov/sogw/slide.lib/sep16-2014/Bill_Implementation .pdf.	**Response**: Disputed. Mississippi objects to Statement No. 18 on the grounds that the statement does not appear to be supported by the citation, and even if it were, the term as used in the cited publication is not appropriate or useful in this case. The statements are general, anecdotal references to geologic formations that underlie multiple states, and the "interstate" labels the publication casually attributes to those formations

		do not reflect an application or analysis of the term "interstate" in any technical context appropriate for this hearing as they could be read as asserting a legal conclusion on the issue before the Court. The article also does not attempt to distinguish between (1) the specific geographic location(s) and sedimentary deposits in the specific geological formation(s), or (2) the sources, quality, location, residence time, or other important hydrologic characteristics of the groundwater stored in the formation(s) under natural conditions. The labels this article may place on geological formations, or aquifers within them taken out of their specific context only confuse the issue before the Court.
D19	Treatises, law reviews, and scientific papers have recognized and characterized the Memphis-Sparta Aquifer as an interstate aquifer. *See, e.g.*, Dan Tarlock, *Law of Water Rights and Resources* § 10:24 (July 2017 Update); Michael D. Tauer, *Evolution of the Doctrine of Equitable Apportionment*, 41 U. Mem. L. Rev. 897, 899, 918 (Summer 2011); Noah D. Hall & Joseph Regalia, *Interstate Groundwater Law Revisited: Mississippi v. Tennessee*, 34 Va. Envtl. L.J. 152, 152, 153, 159 (2016); Noah D. Hall & Joseph Regalia, *Lines in the Sand: Interstate Groundwater Disputes in the Supreme Court*, 31 Nat.	**Response**: Disputed. Mississippi objects to Statement No. 19 on the grounds the statement is not supported by record citations. Mississippi also objects to Defendants' definitions and use of Memphis Sparta Aquifer, and to Defendants' citation to articles that do not provide an accurate description or factual analysis of the aquifers actually at issue in this case. Also, the statements are general, anecdotal references, and the "interstate" label the publications use does not reflect the application or analysis of the term "interstate" in any technical context appropriate for this hearing as they could be read as asserting a legal conclusion on

	Resources & Env't 8, 8 (Fall 2016); John B. Draper, Matthew E. Draper & Jeffrey J. Wechsler, *The Evolving Role of the Supreme Court in Interstate Water Disputes*, 31 Nat. Resources & Env't 3, 4 (Fall 2016); James G. Mandilk, *The Modification of Decrees in the Original Jurisdiction of the Supreme Court*, 125 Yale L.J. 1880, 1926 (May 2016); Emily Brophy, *The Importance of Regulating Transboundary Aquifers*, 10 Sustainable Dev. L. & Pol'y 19, 19 (Fall 2009); Justin Newell, *The Nature of Interstate Groundwater Resources and the Need for States to Effectively Manage the Resource Through Interstate Compacts*, 11 Wyo. L. Rev. 25, 36 (2011); Matthew Ley, *What Are You Going To Do About It?: The Ramifications of the Edwards Aquifer Authority v. Day Decision on Interstate Groundwater Disputes*, 65 Baylor L. Rev. 661, 662 (2013); John D. Leshy, *Interstate Groundwater Resources: The Federal Role*, 14 Hastings W.-Nw. J. Envtl. L. & Pol'y 1475, 1482 & n.25 (2008); Rex A. Mann, *A Horizontal Federalism Solution to the Management of Interstate Aquifers: Considering an Interstate Compact for the High Plains Aquifer*, 88 Tex. L. Rev. 391, 399 (2009); Jacob D. Bielenberg, *When Heavyweights Get Thirsty, Contracts Fall to the Wayside: A Case for Common Contract Principles and Stare Decisis [Kansas v. Nebraska, 135 S. Ct.*	the issue before the Court. The articles also do not attempt to distinguish between (1) the specific geographic location(s) and sedimentary deposits in the specific geological formation(s), or (2) the sources, quality, location, residence time, or other important hydrologic characteristics of the groundwater stored in the formation(s) under natural conditions.

	1042 (2015)], 55 Washburn L.J. 759, 768 n.71 (2016); Noah D. Hall & Benjamin L. Cavataro, *Interstate Groundwater Law in the Snake Valley: Equitable Apportionment and a New Model for Transboundary Aquifer Management*, 6 Utah L. Rev. 1553, 1608-10 (2013); Robert H. Abrams, *The Boundary Waters Treaty of 1909 as a Model for Interjurisdictional Water Governance*, 54 Wayne L. Rev. 1635, 1640-41 (2008); Burke W. Griggs, Ass't Att'y Gen., State of Kansas, *Some Legal and Machiavellian Principles of Interstate Groundwater Dispute Resolution*, Woods Inst. for the Env't, Stanford Univ., 34th Annual Water Law Conference, Am. Bar Ass'n, Mar. 30-31, 2015, *available at* https://www.americanbar.org/content/dam/aba/events/environment_energy_resources/2016/water_law/conference_materials/5-griggs_burke.authcheckdam.pdf.	
D20	Mississippi has represented to the United States District Court for the Northern District of Mississippi and the Fifth Circuit Court of Appeals that the Memphis-Sparta Aquifer—including the groundwater in it—is an interstate aquifer. *See*, *e.g.*, *Hood v. City of Memphis*, No. 2:05CV32-D-B (N.D. Miss.): Complaint [Dkt. No. 2, ¶¶ 9, 11]; Plaintiff's	**Response**: Disputed. Mississippi objects to Statement No. 20, as it takes the subject statements out of context. The statements made by Mississippi were, in substance, simply acknowledgment that the natural geologic formations at issue underlie both parts of Mississippi and Tennessee, and the undisputed fact that excessive pumping by MLGW and others in

	Response to Defendants' (I) Motion to Dismiss for Lack of Ripeness / Lack of Standing, (II) Motion to Dismiss for Failure to Join Indispensable Party, (III) Motion to Dismiss the Tort Claims for Lack of Subject Matter Jurisdiction / Improper Venue [Dkt. No. 29, at 4]; Reply Memorandum of Authorities in Support of Plaintiff's Response to Defendants' Motion (I) to Dismiss for Lack of Ripeness / Lack of Standing, (II) to Dismiss for Failure to Join Indispensable Party, (III) to Dismiss the Tort Claims for Lack of Subject Matter Jurisdiction / Improper Venue [Dkt. No. 32, at 3, 5, 10-11 & nn.9-11, 27 n.27]; Plaintiff's Surrebuttal Memorandum of Authorities [Dkt. No. 39, at 2-3, 8-10]; Plaintiff's Reply Memorandum of Authorities in Support of Response in Opposition to Defendants' Motion to Alter or Amend Order or Alternatively to Certify Order for Interlocutory Appeal [Dkt. No. 59, at 2 & n.2]; First Amended Complaint [Dkt. No. 112, ¶¶ 8, 46]; Plaintiff's Surreply to Defendants' Reply to Plaintiff's Response to Defendants' Motion for Judgment on the Pleadings [Dkt. No. 250, at 5, 7]. *See also Hood v. City of Memphis*, No. 08-60152 (5th Cir.): Brief for Appellant, at 1, 21, 23 (May 14, 2008); Reply Brief of Appellant, at 11, 15 (Aug. 1, 2008).	Shelby County, Tennessee, has directly withdrawn billions of gallons of groundwater naturally stored in Mississippi out of Mississippi and into Tennessee violating Mississippi's territorial sovereignty as consistently maintained in the prior United States District Court litigation. The issue of the legal authority of Tennessee and its political subdivisions or other entities within Tennessee's borders to pump groundwater naturally residing within the State of Mississippi was never addressed by any court on the factual, scientific, or legal merits in those proceedings. Nothing within those proceedings is inconsistent with Mississippi's position in this proceeding: That while the geologic formations in issue underlie several states, the local groundwater within each state at issue in this dispute is "intrastate" due to the source, location, residence time, and other hydrologic characteristics of the groundwater within those formations. The issue in this case is one of first impression, and must be decided based on material facts and principles of law, not on cryptic labels the parties have used from time-to-time.

D21	Groundwater generally flows from areas of higher potentiometric head to areas of lower potentiometric head.	**Stipulated.** *See* Section III, Fact S30.
D22	Groundwater generally flows perpendicular to equipotential lines in the direction of decreasing potentiometric head.	**Stipulated.** *See* Section III, Fact S31.
D23	The shape and size of a cone of depression depends on various factors, including, without limitation, the specific properties of the materials in the aquifer, the location of recharge to the aquifer, and the rate and duration of the pumping. Wiley Dep. Ex. 1, at 6-7; Spruill Dep. 104:3-11.	**Response**: Disputed. Mississippi objects to this statement on the grounds that it is incomplete. Mississippi will agree to this statement of fact if modified to read as follows: "The shape and size of a cone of depression created by pumping wells depends on various factors, including without limitation, the specific hydraulic properties of the aquifer materials within the area of the cone of depression, the sources and location of groundwater recharge supplying to the aquifer, and the rate and duration of the pumping." Wiley Dep. Ex. 1, at 6-7; Spruill Dep. 104:3-11.
D24	Cones of depression for pumping wells can overlap and combine, deepening the cone in the area of overlap.	**Stipulated.** *See* Section III, Fact S32.
D25	The aquifer at issue in this lawsuit is locally referred to by many different names including: "Memphis-Sparta Aquifer," "Sparta Sand," "Sparta/Memphis Sand," "Sparta-Memphis Sand," "Sparta Aquifer	**Response**: Disputed. Mississippi objects to Defendants' definition and use of the "Memphis-Sparta Aquifer" because it does not consider any of the specific local, or regional, subsurface geological

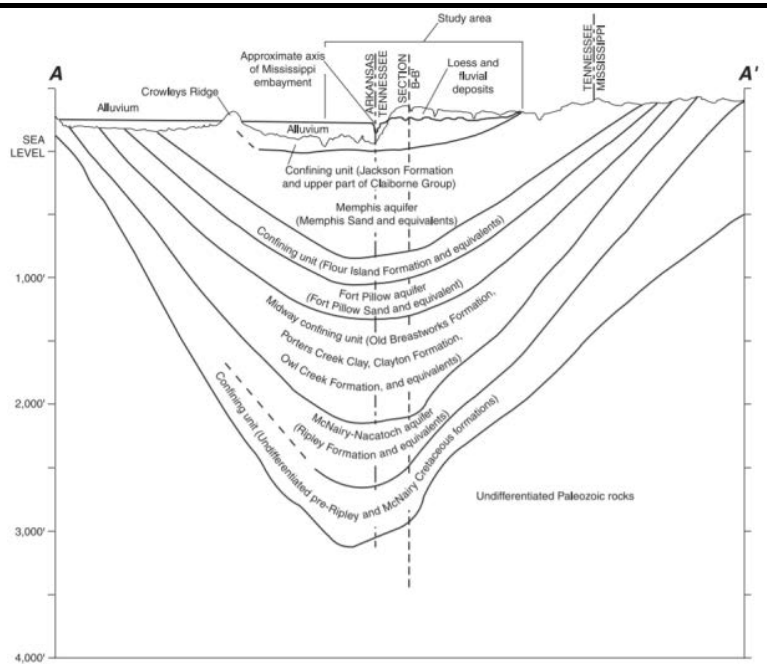
	Sand," "Memphis Sand," "Memphis Aquifer," "Middle Claiborne Aquifer," "Middle Claiborne," "Memphis Sparta Sand Aquifer," "MSSA," and "Sparta Memphis Sand." For purposes of this lawsuit, all of these names refer to the same aquifer. Wiley Dep. 9:14-10:12; Langseth Dep. Ex. 1, §§ 1.5, 2.3, at 4, 10-13, Ex. 4, Tables B.4.1, C.3.1; Larson Dep. Ex. 1, at 12. *See also* Spruill Dep. 8:14-9:9. *Note: For purposes of Defendants' Statement of Undisputed Material Facts, the aquifer at issue shall be referred to as the "Memphis-Sparta Aquifer" or the "Aquifer."*	and hydrological conditions at or near the specific geographic area impacted by the groundwater pumping in extreme northwest Mississippi and west Tennessee in dispute. The "Memphis-Sparta Aquifer" as defined by Defendants—allegedly covering parts of 8 states—does not consist of uniformly deposited layers of homogeneous geological materials and attempts to improperly conflate the entire Mississippi Embayment into one large uninterrupted body of subsurface water. Table 1 from the USGS MERAS report cited by Defendants shows hydrogeologic and geologic units recognized in each state, all of which are not at issue in this case. The groundwater at issue in this lawsuit is located in the confined Sparta Sand formation/aquifer in northwest Mississippi which is confined on the top by the Cook Mountain formation, and on the bottom by the Zilpha Clay formation. The Sparta Sand formation and aquifer is recognized as a separate geologic formation within the Claiborne geological group in Mississippi, Louisiana, and Southern Arkansas. Its bottom confining layer (the Zilpha Clay formation) pinches out and disappears at about 35 degrees north latitude near the Mississippi-Tennessee border and in Tennessee the Sparta Sand is correlative to the top layer of Memphis Sand formation. The Sparta Sand and the Memphis Sand are distinct formations and

		distinct aquifers in the Middle Claiborne geological unit. Because these formations are hydraulically connected, they have been sometimes collectively referred to as the "Sparta-Memphis," "Memphis-Sparta," or the "Middle Claiborne" aquifer in studies including the transition zone. U.S. Geological Survey Hydrological Atlas 730-F, Robert A. Renken ("Atlas 730-F"), 1998 at 17, *et seq*.; USGS Water-Resources Investigations Report 89-4131, Hydrology and Ground-Water Flow in the Memphis and Fort Pillow Aquifers in the Memphis Area, Tennessee (2001) ("Report 89-4131"), at 32; U.S. Geological Survey Water-Resources Investigations Report 86-4364 ("Report 86-4364"), at 4-7; United States Geological Survey Professional Paper 1416-G, R. L. Hoseman (1996) ("Paper 1416-G"), at G; USGS Professional Paper 813-N, Summary Appraisal of the Nation's Groundwater Resources-Lower Mississippi Region, at N15; USGS Professional Paper 569-A, Hydrological Significance of the Lithofacies of the Sparta Sand in Arkansas, Louisiana, Mississippi and Texas (1968) ("Paper 569-A"), at A1, A3, A5.
D26	The Memphis-Sparta Aquifer lies beneath portions of eight states: Tennessee, Mississippi, Arkansas, Kentucky, Missouri, Louisiana, Alabama, and	**Response**: Disputed. Mississippi objects based on Defendants' definition and use of Memphis-Sparta Aquifer. This Proposed Statement of Fact completely disregards the specific local, or regional, natural subsurface geological and hydrological conditions at

	Illinois. Wiley Dep. 12:18-13:12; Spruill Dep. 32:20-33:14, 35:9-14; Larson Dep. Ex. 1, at 12, 17.	or near the specific geographic area impacted by the groundwater pumping in extreme northwest Mississippi and west Tennessee in dispute. The Memphis-Sparta Aquifer as defined by Defendants, allegedly covering parts of 8 states, is not made up of uniformly deposited layers of homogeneous geological materials which Defendants attempt to improperly conflate into one large uninterrupted body of subsurface water. MERAS Table 1; B. Waldron, et al., Mississippi Embayment Regional Groundwater Study (January 2011) ("MERGWS") at 15, 21, 24-26, 42-44. The definition also ignores the local complexities found throughout the Mississippi Embayment, and the specific complexities in the area of the Mississippi-Tennessee border. Atlas 730-F, at 17, et seq.; Report 89-4131, at 32; Report 86-4364, at 4-7; Paper 1416-G, at G15, G18-20, G31; Paper 569-A, at A1, A3, A5.
D27	The USGS has long recognized that the Memphis-Sparta Aquifer extends across state lines. Langseth Dep. Ex. 1, § 2.3, at 10-13; Larson Dep. Ex. 1, at 4-5, 9-10.	**Response**: Disputed. Mississippi objects based on Defendants' definition of the Memphis-Sparta Aquifer. Mississippi acknowledges that in the area of extreme northwest Mississippi and west Tennessee, primarily in DeSoto County, Mississippi, and Shelby County Tennessee, the Memphis Sand (as it is known in Tennessee) is hydrologically connected to the Sparta Sand in Mississippi. Spruill Report at 16;

		Spruill Rebuttal at 2; Atlas 703-F, at 17, et seq.; Report 89-4131, at 32; Report 86-4364, at 4-7; Paper 1416-G, at G15, G18-20, G31; Paper 569-A, at A1, A3, A5.
D28	The generally accepted geographical extent of the Memphis-Sparta Aquifer is shown as the shaded area below. Wiley Dep. 11:17-12:8, Ex. 4; Langseth Dep. Ex. 1, Figure 3.4.1; Larson Dep. Ex. 1, at 2-3, 9-10; Tony P. Schrader, U.S. Dep't of Interior, USGS, *Potentiometric Surface in the Sparta-Memphis Aquifer of the Mississippi Embayment, Spring 2007*, Scientific Investigations Map 3014 (2008), *available at* https://pubs.usgs.gov/sim/3014/.	**Response**: Disputed. Mississippi objects based on Defendants' definition and use of the Memphis-Sparta Aquifer. The alleged Memphis-Sparta Aquifer is not coextensive with the Mississippi Embayment in its geologic composition, or in the characteristics of groundwater flow, including direction, residence time, water quality, specific yield, etc. within all of northwest Mississippi. MERGWS at 15, 21, 24-26, 42-44; MERAS Table 1.

		
D29	In cross-section, the Mississippi Embayment has alternating layers of aquifers and confining units. Below is a USGS illustrated cross-section of the Mississippi Embayment's stratigraphy in the area of the Tennessee-Mississippi state line. Note: Vertical scale greatly exaggerated.	**Stipulated.** *See* Section III, Fact S33.

		
D30	The Memphis-Sparta Aquifer is represented by layers 5-10 in the USGS MERAS model, and layer 2 in the USGS "Brahana and Broshears" model. See MERAS Report at 8, Table 1; Brahana & Broshears Report at 26.	**Response**: Disputed. Mississippi objects to Defendants' definition and use of the Memphis-Sparta Aquifer, and Defendants' resulting description of both the USGS MERAS and the Brahana & Broshears' models. Mississippi also objects to the statement as factually inaccurate. MERAS at 13, Figure 8 (Middle Claiborne Aquifer only represented by layers 5-7). The Mississippi Embayment is an incredibly complex geological system containing inconsistently deposited heterogeneous sedimentary materials that do not

		correlate throughout the system geologically or hydrogeologically. This complexity is recognized, but not actually addressed in the MERAS study and model (at 56, Limitation of Analyses). Paper 1416-G, generally, and at G2-3, G18-21; Atlas 730-F, at 17, et seq.; Report 89-4131, at 32; Report 86-4364, at 4-7; MERAS at 9, 15.
D31	The Memphis-Sparta Aquifer has both confined and unconfined areas. Spruill Dep. 36:13-16.	**Response**: Disputed. Mississippi objects to Defendants' definition and use of the Memphis-Sparta Aquifer. The Memphis Sand in west Tennessee and the Sparta Sand in northwest Mississippi both have confined areas and unconfined outcrops. Spruill Report at 18; Atlas 703-F, at 17, et seq.; Report 89-4131, at 32; Report 86-4364, at 4-7; Paper 1416-G, at G15, G18-20, G31.
D32	The Memphis-Sparta Aquifer is part of the Mississippi Embayment Aquifer System—a regionally extensive system of hydrologically connected aquifers and confining layers extending beneath portions of Tennessee, Mississippi, Arkansas, Kentucky, Missouri, Louisiana, Alabama, and Illinois. Spruill Dep. Ex. 1, at 11; Langseth Dep. Ex. 1, §§ 1.5, 2.2, at 4, 7-10.	**Response**: Disputed. Mississippi objects to Defendants' definition and use of the Memphis Sparta Aquifer. Distant hydrological connections are also not in any way involved in the groundwater dispute before the Court. Wiley Report at 5-8; Atlas 703-F, at 17, et seq.; Report 89-4131, at 32; Report 86-4364, at 4-7; Paper 569-A, at A1, A3, A5; MERAS at 9, 15.
D33	A transboundary aquifer is an aquifer that exists on both sides of a political boundary, such as a state line. Wiley Dep. 22:23-23:1.	**Response**: Disputed. Mississippi objects because "transboundary aquifer" is excessively broad, potentially misleading, and confusing. The phrase has no generally understood and accepted scientific or

		legal definition or significance with regard to the jurisdiction or responsibility of the separate sovereigns with respect to management of surface or groundwater resources within their respective sovereign territory; water rights of either sovereign state within its sovereign territory under the Constitution and laws of the United States; or the application of either state's water law within its sovereign territory. Atlas 703-F, at 17, et seq.; Report 89-4131, at 32; Report 86-4364, at 4-7; Paper 1416-G, at G15, G18-20, G31; Paper 569-A, at A1, A3, A5; MERAS at 9, 15.
D34	The Memphis-Sparta Aquifer is a transboundary aquifer. Wiley Dep. 23:2-6; Spruill Dep. 77:4-14.	**Response**: Disputed. Mississippi objects to Defendants' definition and use of the Memphis-Sparta Aquifer, and Defendants' definition of "transboundary aquifer." Mississippi will agree to the following statement of fact: "The geologic formations classified as aquifers underlying extreme northwest Mississippi and west Tennessee have been the subject of scientific studies in the area of the common state border dividing the two states by the United States Geological Survey. These studies recognize certain hydrological connections between parts of the Memphis Sand and Sparta Sand aquifers near the common border between the two states." Atlas 703-F, at 17, *et seq.*; Report 89-4131, at 32; Report 86-4364, at 4-7; Paper 1416-G; Paper 569-A, at A1, A3, A5.

D35	All of the groundwater in the Memphis-Sparta Aquifer, including all of the groundwater beneath Mississippi, was continually flowing under pre-development conditions and continues to flow today. Spruill Dep. 41:14-17, 41:24-42:4, Ex. 4, at 27-28; Wiley 2007 Dep. 29:8- 15, 30:4-7; Crawford Dep. 89:12-16, 89:20-22, 102:18-19; Hoffman Dep. 24:15-18; Langseth Dep. Ex. 1, § 3.5, at 22-23; Larson Dep. Ex. 1, at 4, 20-21.	**Response**: Disputed. Mississippi objects to Defendants' definition and use of Memphis-Sparta Aquifer. Mississippi also objects to the statement as incomplete and misleading. For example, the phrase "continually flowing," is clearly intended to suggest the equivalent of an underground stream flow, perpetuating the misconception addressed in USGS Groundwater Supply Paper 2220 cited above as Heath, *Basic Ground-Water Hydrology*. "Common misconceptions include the belief that ground water occurs in underground rivers resembling surface streams whose presence can be detected by certain individuals. These and other have hampered the development and conservation of ground water and have adversely affected the protection of its quality." *Id.* Preface. Natural surface water movement is measured in miles per day, compared to the natural confined groundwater movement in the relevant territorial area measured in inches per day or less, depending on the specific hydraulic properties of the aquifer and confining beds within that area. Such groundwater movement can take "thousands of years (millennia)." Wiley Report at 9-10; Wiley Rebuttal at 4 and Figure 1. Groundwater age, the time since recharge, is important in determining groundwater flow velocity and recharge rate. MERGS at 83. The phrase all of the groundwater in the entire Mississippi

		Embayment was continually moving disregards the discontinuous, heterogeneous and anisotropic nature of the formations, and the fact that the groundwater resides in pores between rock particles. Atlas 703-F, at 17, *et seq.*; Report 89-4131, at 32; Report 86-4364, at 4-7; Paper 1416-G, at G15, G18-20, G31; Paper 569-A, at A1, A3, A5; Heath, at 19.
D36	The Memphis-Sparta Aquifer is composed largely of thick beds of sand that are highly transmissive (meaning that water can travel through the aquifer at a relatively high rate). Spruill Dep. Ex. 1, at 3, 14; Waldron Dep. Ex. 1, at 10; Larson Dep. Ex. 1, at 9, 12; Langseth Dep. Ex. 1, § 2.2, at 8.	**Response**: Disputed. Mississippi objects to Defendants' definition and use of Memphis-Sparta Aquifer. Mississippi also objects to the use of the phrase "highly transmissive" and the following parenthetical without qualifying context as incomplete and misleading, and the parenthetical does not even appear in and is not supported by Defendants' citations. (Spruill Dep. Ex. 1, at 3,14; Waldron Dep. Ex. 1, at 10; Larson Dep. Ex. 1, at 9, 12; Langseth Dep. Ex. 1 § 2.2, at 8). Mississippi proposes the following statement of fact as an alternative: "The Sparta Sand formation within extreme northwest Mississippi contains thick beds of sand and other materials in various combinations providing a heterogeneous and anisotropic aquifer that is transmissive as measured in groundwater metrics, and groundwater within the cones of depression created by pumping wells can be moved towards the pumps at a groundwater velocity as high as several feet a day as the groundwater moves closer to the well

		pumps." Atlas 703-F, at 17, et seq.; Report 89-4131, at 32; Report 86-4364, at 4-7; Paper 1416-G, at G15, G18-20, G31; Paper 569-A, at A1, A3, A5.
D37	Groundwater in the Memphis-Sparta Aquifer is located within and moves through the small openings between particles of soil, rock, or mineral referred to as pore spaces. Spruill Dep. Ex. 1, at 4; Langseth Dep. Ex. 1, § 2.1, at 6; Larson Dep. Ex. 1, at 9.	**Response**: Disputed. Mississippi objects to Defendants' definition and use of Memphis-Sparta Aquifer. Mississippi proposes the following: "Groundwater located in the confined Sparta Sand formation in extreme northwest Mississippi naturally resides within and moves through the small openings between particles of sand and other geologic material referred to as pore spaces." Wiley Report at 9-10; Heath, at 19.
D38	Water flow patterns in the Memphis-Sparta Aquifer were not influenced by state lines under pre-development conditions and are not influenced by state lines under current conditions. Wiley Dep. 184:16-23, 185:3-5; Langseth Dep. Ex. 1, § 1.2, at 2.	**Response**: Disputed. Mississippi objects to Defendants' definition and use of Memphis-Sparta Aquifer. Mississippi proposes the following: "Neither groundwater movement direction nor rate of movement within the Memphis Sand in southwest Tennessee or in the Sparta Sand in northwest Mississippi is influenced by the location of the common state border."
D39	In the area of the Mississippi-Tennessee border, the bottom of the Memphis-Sparta Aquifer slopes gently downward in a northwesterly direction from the eastern outcrop area in Mississippi and Tennessee generally toward the Mississippi River.	**Response**: Disputed. Mississippi objects to Defendants' definition and use of Memphis-Sparta Aquifer. Mississippi also objects to Defendants' statement, which is, without additional qualifying facts, incomplete and misleading.. Defendants' record citations do not factually support this statement with regard to most of the Mississippi-Tennessee border

		for the confined Sparta Sand formation. Wiley Report at 11; Spruill Report at 23-24; Wiley Rebuttal at 4.
D40	Under pre-development conditions, all groundwater entering and flowing through the Memphis-Sparta Aquifer in Mississippi would eventually leave Mississippi. Langseth Dep. Ex. 1, § 1.2, at 2; Wiley Dep. 192:22-193:1, 193:16-23.	**Response**: Disputed. Mississippi objects to Defendants' definition and use of Memphis-Sparta Aquifer. Mississippi further objects to this statement because the word "eventually" is overly broad, extremely vague, ambiguous, and misleading (e.g., "the sun will eventually burn out"). In this regard the statement completely ignores the specific local geological and hydrological conditions and the related residence time, and travel time within that region. Wiley Report at 9-10; Wiley Rebuttal at 4 and Figure 1.
D41	Since pumping began, groundwater entering and flowing through the Memphis-Sparta Aquifer beneath Mississippi has or will, under current flow patterns, ultimately leave the State either by being pumped out of the ground in Mississippi or by continuing to flow until it leaves Mississippi. Langseth Dep. Ex. 1, § 3.6, at 23-24.	**Response**: Disputed. Mississippi objects to Defendants' definition and use of Memphis-Sparta Aquifer. Mississippi also objects to Defendants' statement because it is confusing and misleading, in that it mixes pre-development and post-development while also using the vague and ambiguous word "ultimately" like "eventually," completely ignoring residence time and travel time. Wiley Report at 9-10; Wiley Rebuttal at 4 and Figure 1.
D42	The Memphis-Sparta Aquifer is hydrologically connected to other aquifers in the Mississippi Embayment, including the Fort Pillow Aquifer, below, and the surficial or water-table unconfined aquifers, above. Langseth Dep. Ex. 1, § 2.2, at 7-10;	**Response**: Disputed. Mississippi objects to Defendants' definition and use of Memphis-Sparta Aquifer. Mississippi also objects to Defendants' statement of fact without additional qualifying facts as incomplete and misleading. MERGWS at 15, 21, 24-

	Wiley Dep. 188:17-189:15; Larson Dep. Ex. 1, at 12; Spruill Dep. 39:5-10, 40:2-10.	26, 42-44; MERAS Table 1; Wiley Report at 5-8. The use of "hydrologically connected" in the context is misleading. With regard to the Fort Pillow specifically, it is separated from the Memphis Sand by a 140 to 310 foot clay confining layer, and head differences occur because of pumping. It is not a source of meaningful natural recharge for the Memphis Sand, it does not exist in Mississippi, and groundwater within it is not the subject of Mississippi's lawsuit. Brahana & Broshears Report at 13-15.
D43	The Memphis-Sparta Aquifer is hydrologically connected to surface water in Mississippi and Tennessee, including tributaries of the Mississippi River such as the Wolf River and the Coldwater River. Spruill Dep. 40:11-41:10; Larson Dep. Ex. 1, at 3, 12-13; Langseth Dep. Ex. 1, § 3.2.2.2, at 18, Ex. 4, Figure 3.2.3.	**Response**: Disputed. Mississippi objects to Defendants' definition and use of Memphis-Sparta Aquifer. Mississippi also objects to Defendants' statement of fact without additional qualifying facts as incomplete and misleading as discussed in its Responses to D40 &41 above. MERGWS at 15, 21, 24-26, 42-44; MERAS Table 1; Wiley Report at 5-8; Paper 569-A at A6.
D44	The Memphis-Sparta Aquifer's outcrop area is located in both Tennessee and Mississippi. Wiley Dep. Ex. 1, Figure 5; Langseth Dep. Ex. 4, Figure C.3.1.	**Response**: Disputed. Objection as incomplete and misleading based on Defendants' definition and use of Memphis-Sparta Aquifer. Mississippi Mississippi agrees that the Sparta Sand aquifer and the Memphis Sand aquifer both outcrop to the east of the Mississippi River as shown by the Wiley Report at 9-10 and Figure 5.

D45	The Memphis-Sparta Aquifer is, and was under pre-development conditions, recharged by rainfall in its outcrop area and by groundwater from the Fort Pillow Aquifer below. Wiley Dep. 13:13- 16; 14:8-11, 14:13-17; Spruill Dep. Ex. 1, at 18; Langseth Dep. Ex. 1, §§ 2.2, 3.2, at 8-9, 16-19; Larson Dep. Ex. 1, at 12.	**Response**: Disputed. Mississippi objects to Defendants' definition and use of Memphis-Sparta Aquifer. Mississippi also objects to this Proposed Statement of Fact as incomplete and misleading in its statement of pre-development conditions, and fails to address changes caused by development. While recharge of the Memphis Sand in west Tennessee, and the Memphis Sand and Sparta Sand in extreme northwest Mississippi during the pre-development prevailing for tens of thousands of years occurred at outcrops, these two aquifers recharged and discharged in multiple directions through multiple locations, not limited to the Fort Pillow below the Memphis Sand, based on the complexity of the geology in the Mississippi/Tennessee border region; however, natural recharge from the Fort Pillow to the Memphis Sand is not clear. Wiley Report at 9-10; Wiley Rebuttal at 4 and Figure 1; Spruill Report at 3, 18, 23-24; Brahana & Broshears report at 52-53.
D46	The Memphis-Sparta Aquifer is also recharged from the overlying surficial aquifer outside of the outcrop area and from surface streams. Spruill Dep. Ex. 1, at 18; Langseth Dep. Ex. 1, § 3.2.2.2, at 18.	**Response**: Disputed. Mississippi objects to Defendants' definition and use of Memphis-Sparta Aquifer. Mississippi also objects to this statement as incomplete, because it is not confined by territory or time. Mississippi specifically denies that this was a natural discharge area pre-development. Wiley Report at 9-11; Wiley Rebuttal at 4 and Figure 1; Spruill Report at 3, 18, 23-24.

D47	Under pre-development conditions, some water in the Memphis-Sparta Aquifer discharged upward through overlying aquifers and confining layers into the Mississippi River. Spruill Dep. Ex. 1, at 23; Larson Dep. Ex. 1, at 12.	**Response**: Disputed. Mississippi objects to Defendants' definition and use of Memphis-Sparta Aquifer. Mississippi agrees that "Under pre-development conditions" the confined aquifers underlying west Tennessee and northwest Mississippi provided groundwater discharge for the Mississippi Alluvial and overlying aquifers." Wiley Report at 9-11; Wiley Rebuttal at 4 and Figure 1; Spruill Report at 3, 18, 23-24; Brahana & Broshears Report at 52-53.
D48	There are no barriers in the Memphis-Sparta Aquifer that align with state boundaries that impede or prevent the flow of groundwater across the Tennessee-Mississippi border, and there never have been such barriers. Wiley Dep. 108:6-16, 135:4-8, 135:23-136:2, 137:16-21; Spruill Dep. 37:24-38:9; Larson Dep. Ex. 1, at 3; Waldron Dep. Ex. 1, at 2.	**Response**: Disputed. Mississippi objects to Defendants' definition of Memphis- Sparta Aquifer. Mississippi also objects to Defendants' statement of fact without additional qualifying facts as incomplete and misleading. Mississippi agrees that there is no physical subterranean wall or dam underlying the Tennessee- Mississippi border, and that there never has been such a physical "barrier" constructed which totally blocks all possible groundwater movement between states. This Proposed Statement of Fact completely disregards the major natural geological and hydrological changes within and between the Memphis Sand in Tennessee, and the Sparta Sand in Mississippi near the Mississippi-Tennessee border. This major geological and hydrological transition is clearly seen in the changes in geological formations shown in Table 1 of the MERAS report. These changes in geology are very complex and not fully

		understood, but it is well documented that they introduce a hydraulic "lateral impermeable boundary" at the transition which must be considered in any discussion on this topic. Table 1 in the MERAS report clearly shows the geological transitions. The hydraulic complexities related to these types of geological changes are discussed in Heath, Basic Ground-Water Hydrology, 46 -51. *See also* Wiley Report at 5, 7, 10-11, 13-14, Figure 12 (natural (pre-development) hydrologic conditions in northwest Mississippi impede or prevent flow of confined groundwater into Tennessee under natural conditions).
D49	Under pre-development conditions and at present, groundwater in the Memphis-Sparta Aquifer flows across multiple state boundaries. Langseth Dep. Ex. 1, §§ 3.2.2.1, 3.3, at 17, 19-20, Ex. 4, Figures 3.3.1b, 3.3.2a, 3.3.2b, 3.3.3; Spruill Dep. Ex. 1, Figure 17; Wiley Dep. 71:18-21, 73:3-19, 96:19-23, 141:6-142:9, 163:22-164:7, Ex. 1, Figures 9, 23, Ex. 2, Figure 5; Gentry Dep. 165:12-16.	**Response**: Disputed. Mississippi objects to Defendants' definition and use of Memphis-Sparta Aquifer. Mississippi also objects to Defendants' statement without additional qualifying facts as incomplete and misleading. Based on the information provided to date and using the Defendants' definition of "Memphis-Sparta Aquifer" this is not an unqualified true statement, and is misleading without territorial limitations, specific state border identification and location, specific geological information, and reference to time. Wiley Report at 9-10; Wiley Rebuttal at 4 and Figure 1; *see* Langseth Dep. Ex. 1, Figure 3.3.3 (water entering outcrop area at blue flow path northwest of Meridian would flow

		within Mississippi more than 150 miles before entering Louisiana; at a flow rate at one inch per day (*see* Wiley Report at 10), this water would be located within Mississippi for more than 26,000 years); Atlas 703-F, at 17, et seq.; Report 89-4131, at 32; Report 86-4364, at 4-7; Paper 1416-G, at G15, G18-20, G31; Paper 569-A, at A1, A3, A5.
D50	Under pre-development conditions, some groundwater in the Memphis-Sparta Aquifer naturally flowed within the Aquifer from Mississippi, across the state line, into Tennessee. Spruill Dep. 142:8- 16, Ex. 1, Figure 17; Wiley Dep. 14:18-15:14, 71:18-21, Ex. 1, Figures 9, 23, Ex. 2, Figure 5; Langseth Dep. Ex. 1, § 3.2.2.1, at 17.	**Response**: Disputed. Mississippi objects to Defendants' definition and use of Memphis-Sparta Aquifer. Mississippi also objects to Defendants' statement of fact without additional qualifying facts as incomplete and misleading. Mississippi acknowledges that in certain, limited locations, some confined groundwater that had been in Mississippi for hundreds or thousands of years moved very slowly at a rate of inches a day from Mississippi into Tennessee under pre-development conditions. Wiley Report at 7, 109-11; Wiley Rebuttal at 4 and Figure 1.
D51	Under pre-development conditions, some groundwater in the Memphis-Sparta Aquifer naturally flowed within the Aquifer from Mississippi, across the state line, into Louisiana. Spruill Dep. Ex. 1, Figure 9; Langseth Dep. Ex. 1, Figure 3.3.3.	**Response**: Disputed. Mississippi objects to Defendants' definition and use of Memphis-Sparta Aquifer. Mississippi also objects to Defendants' statement of fact without additional qualifying facts as incomplete and misleading. Subject to these objections, Mississippi acknowledges that under pre-development conditions, some confined groundwater in Mississippi—outside of the regional area in dispute in this case further south in Mississippi—that was not

		discharged into the Mississippi Alluvial aquifer, may have crossed under the Mississippi River over a period of thousands of years after entering the confined aquifer system. Wiley Report at 9-10; Wiley Rebuttal at 4 and Figure 1; see Langseth Dep. Ex. 1, Figure 3.3.3 (water entering outcrop area at blue flow path northwest of Meridian would flow within Mississippi more than 150 miles before entering Louisiana; at a flow rate at one inch per day (see Wiley Report at 10), this water would be located within Mississippi for more than 26,000 years).
D52	Under pre-development conditions, some groundwater in the Memphis-Sparta Aquifer naturally flowed within the Aquifer from Tennessee, across the state line, into Arkansas. Wiley Dep. Ex. 1, Figures 9, 23, Ex. 2, Figure 5; Spruill Dep. Ex. 1, Figure 17; Langseth Dep. Ex. 4, Figures 3.3.1b, 3.3.2a, 3.3.2b, 3.3.3.	**Response**: Disputed. Mississippi objects to Defendants' definition and use of Memphis-Sparta Aquifer. Mississippi also objects to Defendants' statement of fact without additional qualifying facts as incomplete and misleading. Subject to these objections, Mississippi acknowledges that under pre-development conditions, some confined groundwater in Tennessee that was not discharged into the Mississippi Alluvial aquifer, may have crossed under the Mississippi River over a period of thousands of years after entering the confined aquifer system. Wiley Dep. 142:3-9; Wiley Report at 9-10; Wiley Rebuttal at 4 and Figure 1; Atlas 703-F, at 17, *et seq.*; Report 89-4131, at 32; Report 86-4364, at 4-7; Paper 1416-G, at G15, G18-20, G31; Paper 569-A, at A1, A3, A5.

D53	A groundwater flow path that passes through multiple states is an interstate flow path. Wiley Dep. 142:3-9.	**Response**: Disputed. Mississippi objects to Defendants' Statement of Fact as overly broad, vague, incomplete and impossible to verify. Neither the United States Supreme Court nor Congress has ever defined "interstate groundwater flow" within a confined aquifer. Given the almost infinite differences and complexities in groundwater aquifers at or near state borders, no such overly broad, general definition which disregards such local differences is appropriate. Wiley Report at 9-10; Wiley Rebuttal at 4 and Figure 1.
D54	Under pre-development conditions, some of the groundwater that recharged into the Memphis-Sparta Aquifer in Mississippi followed interstate flow paths, including into Tennessee. Wiley Dep. 71:18-21, 73:3-19, 96:19-23, 141:6-142:9, 163:22-164:7, Ex. 1, Figure 9; Gentry Dep. 165:12-16; Langseth Dep. Ex. 1, § 3.3, at 19-20.	**Response**: Disputed. Mississippi objects to Defendants' definition and use of Memphis-Sparta Aquifer, and to Defendants' definition of "interstate groundwater flow." Mississippi also objects to Defendants' statement of fact as overly broad, vague, incomplete and misleading without additional qualifying facts. Subject to these objections, Mississippi acknowledges that some confined groundwater that had been in Mississippi for hundreds of years moved very slowly at a rate of about an inch a day north across the common Mississippi-Tennessee border under pre-development conditions. Wiley Report at 7, 9-101; Wiley Rebuttal at 4 and Figure 1.
D55	Under pre-development conditions, some precipitation that fell in Mississippi percolated down into the Memphis-Sparta Aquifer within Mississippi	**Response**: Disputed. Mississippi objects to Defendants' definition and use of Memphis-Sparta Aquifer. Mississippi also objects to Defendants'

	and then flowed northward in the Memphis-Sparta Aquifer across the state line into Tennessee. Langseth Dep. Ex. 1, § 3.2.2.1, at 17.	statement of fact as overly broad, vague, incomplete and misleading without additional qualifying facts. Subject to these objections, Mississippi acknowledges that some confined groundwater that had been in Mississippi for hundreds of years moved very slowly at a rate of about an inch a day north across the common Mississippi-Tennessee border under pre-development conditions. Wiley Report at 7, 9-11; Wiley Rebuttal at 4 and Figure 1.
D56	Under pre-development conditions, some precipitation that fell in Mississippi entered an interstate river within Mississippi, such as the Wolf River or Hatchie River, flowed across the state line in the river, and then percolated down into the Memphis-Sparta Aquifer underlying Tennessee. Langseth Dep. Ex. 1, § 3.2.2.2, at 18.	**Response**: Disputed. Mississippi objects to Defendants' definition and use of Memphis-Sparta Aquifer. Subject to this objection, Mississippi acknowledges that some precipitation falling in Mississippi under pre-development conditions and collecting in the Wolf River and Hatchie River flowed across the current state border into Tennessee, and percolated down into the groundwater system within Tennessee where it remained for hundreds and thousands of years unless pumped from the ground. Wiley Report at 9-11; Wiley Rebuttal at 4 and Figure 1.
D57	Under pre-development conditions, some precipitation that fell in Mississippi percolated down into the deeper Fort Pillow Aquifer within Mississippi, flowed across the state line into Tennessee, and then flowed upward into the Memphis-Sparta Aquifer underlying Tennessee.	**Response**: Disputed. Mississippi objects to Defendants' definition and use of Memphis-Sparta Aquifer. Mississippi further objects because the Fort Pillow Aquifer is not a recognized aquifer within Mississippi. See MERAS Report Table 1. Mississippi further objects to this statement as overly broad,

	Some of the water entering into the Fort Pillow Aquifer in Mississippi flowed upwards into the Memphis-Sparta Aquifer while still in Mississippi and then flowed laterally in the Memphis-Sparta Aquifer across the state line into Tennessee. Langseth Dep. Ex. 1, § 3.2.2.3, at 18-19.	vague, incomplete and misleading without additional qualifying facts, including flow time. Wiley Report at 9-11; Wiley Rebuttal at 4 and Figure 1; *see* Langseth at 18-19 and Figure 3.2.4A (flow path depicts water movement for a distance of approximately 150 miles; at a flow rate of one inch per day (*see* Wiley Report at 10), the depicted water movement would take place over a period of time in excess of 26,000 years); Brahana & Broshears at 13-15.
D58	That pumping from an aquifer in one state can impact the flow direction and potentiometric head in that same aquifer in another state is direct evidence that the aquifer extends beneath the state line. Langseth Dep. 130:4-9.	**Response**: Disputed. Mississippi objects on the grounds the statement is vague and incomplete without additional qualifying facts, and is a legal conclusion. Mississippi acknowledges that the fact pumping in one state from a confined aquifer has an impact on the potentiometric head and flow direction in a confined aquifer in another state is evidence that the two confined aquifers share a hydrological connection. Spruill Report at 16 and Figure 4; MERAS Table 1.
D59	The Memphis-Sparta Aquifer is one of the most productive aquifers in both Shelby County, Tennessee, and DeSoto County, Mississippi. Wiley Dep. 15:21-16:1.	**Response**: Disputed. Mississippi objects to Defendants' definition and use of Memphis-Sparta Aquifer. The Memphis Sand and the Sparta Sand are hydrologically connected, but are not identical in their composition. MERAS Table 1; Spruill Report at Figure 4; Atlas 703-F, at 17, et seq.; Report 89-4131, at 32; Report 86-4364, at 4-7; Paper 1416-G, at G15, G18-20, G31; Paper 569-A, at A1, A3, A5. Each is

		the most productive aquifer within its respective area of the separate states: west Tennessee and northwest Mississippi.
D60	The Memphis-Sparta Aquifer is a primary source of fresh water for northwest Mississippi and Shelby County, Tennessee. Wiley Dep. 12:13-17.	**Response**: Disputed. Mississippi objects to Defendants' definition and use of Memphis-Sparta Aquifer. Mississippi also objects to Defendants' statement of fact as overly broad, vague, incomplete and misleading without additional qualifying facts. Without waiving its objections, Mississippi acknowledges that the Memphis Sand and the Sparta Sand are valuable sources of groundwater within each state, but denies that they are identical in their relative geologic and hydrological composition in both states. MERAS Table 1; Spruill Report at Figure 4; Atlas 703-F, at 17, et seq.; Report 89-4131, at 32; Report 86-4364, at 4-7; Paper 1416-G, at G15, G18-20, G31; Paper 569-A, at A1, A3, A5.
D61	The Memphis-Sparta Aquifer is the largest source of water for municipal and industrial use in the southwest Tennessee - northwest Mississippi area. Wiley Dep. Ex. 1, at 10.	**Response**: Disputed. Mississippi objects to Defendants' definition and use of Memphis-Sparta Aquifer. Mississippi also objects to Defendants' statement of fact as overly broad, vague, incomplete and misleading without additional qualifying facts. MERAS Table 1; Spruill Report at Figure 4. The Mississippi River is the largest source of water available for municipal and industrial use along its course.

D62	In western Tennessee, the Memphis-Sparta Aquifer is the primary source of public drinking water; in northern Mississippi, the Memphis-Sparta Aquifer is also the primary source of public drinking water and is increasingly used for agriculture; and, in eastcentral and southern Arkansas and northern Louisiana, the Memphis-Sparta Aquifer is used for public drinking water, industrial, and agricultural purposes. Langseth Dep. Ex. 1, § 3.1, at 15.	**Response**: Disputed. Mississippi objects to Defendants' definition and use of Memphis-Sparta aquifer. Mississippi also objects to Defendants' statement of fact as overly broad, vague, incomplete and misleading without additional qualifying facts. MERAS Table 1; Spruill Report at Figure 4. Without waiving its objections, Mississippi acknowledges that the Memphis Sand aquifer has been heavily developed in western Tennessee without regard to the long term sustainability and water quality in Tennessee and Mississippi as a natural resource. Spruill Report at 3. Mississippi also acknowledges that the Sparta Sand aquifer is a primary source of high quality groundwater within Mississippi.
D63	All of Memphis Light, Gas & Water Division's wells are physically located entirely within Tennessee.	**Stipulated.** *See* Section III, Fact S34.
D64	Groundwater wells in Mississippi and Tennessee are drilled straight down. There are no wells in either State that are drilled at a slant so that part of the pump or well physically crosses the Mississippi- Tennessee state line.	**Stipulated.** *See* Section III, Fact S35.
D65	Wells in Tennessee and wells in Mississippi access and pump from the same aquifer, the Memphis-Sparta Aquifer. Wiley Dep. 18:23-19:6, 132:6-10; Crawford Dep. 138:21-139:1.	**Response**: Disputed. Mississippi objects to Defendants' definition and use of Memphis-Sparta Aquifer. Mississippi also objects to Defendants' statement of fact as overly broad, vague, incomplete and misleading without additional qualifying facts. MERAS Table 1; Spruill Report at Figure 4;

		MERGWS at 15, 21, 24-26, 42-44. Without waiving its objections, Mississippi acknowledges that near the Mississippi/Tennessee territorial border, there is hydrological connection between the Memphis Sand and the Sparta Sand within Mississippi. Depending on their distance from the border, pumping in each state may have some impact in the other. Spruill Dep. at 227-29. The impact of pumping in Mississippi is not material on Tennessee's naturally occurring groundwater resources. The pumping within Tennessee has taken billions of gallons of naturally occurring groundwater out of Mississippi and had a material impact on Mississippi's natural groundwater resource. Wiley Report at 5-8; Randall W. Gentry Deposition (August 7, 2006) ("Gentry Dep.") at 10, 14-15, 20-24, 28-43, 77-79, 130-31, 178-41 and Exhibits 2, 3 and 4; MERGWS at 7-9.
D66	Arkansas, Tennessee, and Mississippi utilize the Memphis-Sparta Aquifer and each has a stake in the Aquifer. Branch Dep. 45:24-46:8.	**Response**: Disputed. Mississippi objects to Defendants' definition and use of Memphis-Sparta Aquifer and the Aquifer. Mississippi also objects to Defendants' statement of fact as a legal conclusion and as overly broad, vague, incomplete and misleading without additional qualifying facts. MERAS Table 1; Spruill Report at Figure 4; MERGWS at 15, 21, 24-26, 42-44. Arkansas has not made any claims that Mississippi has taken its natural resource by pumping or otherwise, and has never

		asserted a "stake" in Mississippi pumping within the Mississippi Sparta Sand. Likewise, Mississippi has not asserted a "stake" in groundwater naturally residing within Tennessee's borders. Without waiving its objections, Mississippi acknowledges that neither state has a right to develop groundwater within its borders in such a way that it has a material impact on its neighboring state's groundwater natural resources as Defendants have done in Tennessee. Wiley Report at 5-11.
D67	Both Tennessee and Mississippi have an interest in this shared resource (i.e., the Memphis-Sparta Aquifer). Crawford Dep. 133:10-20, 138:16-22.	**Response**: Disputed. Mississippi objects to Defendants' definition and use of Memphis-Sparta Aquifer. Mississippi also objects to Defendants' statement of fact as a legal conclusion and overly broad, vague, incomplete and misleading without additional qualifying facts. Mississippi denies that the groundwater naturally residing in either state is a shared natural resource as claimed by Defendants. Wiley Report at 5-11; Wiley Rebuttal at 4 and Figure 1.
D68	The Memphis-Sparta Aquifer is shared by Tennessee, Mississippi, and the other states that overlie it. Langseth Dep. Ex. 1, § 3.1, at 15-16; Crawford Dep. 138:16-22.	**Response**: Disputed. Mississippi objects to Defendants' definition and use of Memphis-Sparta Aquifer. Mississippi also objects to Defendants' statement of fact as a legal conclusion and as overly broad, vague, incomplete and misleading without additional qualifying facts. MERAS Table 1; Spruill Report at Figure 4; MERGWS at 15, 21, 24-26, 42-44.

		Mississippi denies that the groundwater naturally residing in either state is a shared natural resource as claimed by Defendants. Wiley Report at 5-11; Wiley Rebuttal at 4 and Figure 1.
D69	Technical/scientific literature addressing the Memphis-Sparta Aquifer in the Tennessee-Mississippi border region uniformly acknowledges that the Memphis-Sparta Aquifer exists on both sides of the Mississippi-Tennessee state line. Langseth Dep. Ex. 1, § 2.3, at 10-13.	**Response**: Disputed. Mississippi objects to Defendants' definition and use of Memphis-Sparta Aquifer. Mississippi also objects to Defendants' statement of fact as overly broad, vague, incomplete and misleading without additional qualifying facts. MERAS Table 1; Spruill Report at Figure 4; MERGWS at 15, 21, 24-26, 42-44. Mississippi has seen no technical/scientific literature supporting Defendants identification of a Memphis-Sparta Aquifer having all the characteristics Defendants roll into this alleged classification. Mississippi acknowledges that the Sparta Sand lower confining unit disappears through facies changes near the border and the Sparta Sand coincides with the top of the Memphis Sand. USGS Professional Paper 448-D, Tertiary Aquifers in the Mississippi Embayment (1968) ("Paper 448-D"), at D18; USGS Scientific Investigations Map 3014 (2007).
D70	Every USGS numerical (computer) model that has simulated the Memphis-Sparta Aquifer in the Tennessee-Mississippi border region, including the MERAS model and the Brahana and Broshears model, represents the Memphis-Sparta Aquifer as	**Response**: Disputed. Mississippi objects to Defendants' definition and use of Memphis-Sparta Aquifer. Mississippi also objects to Defendants' statement of fact as overly broad, vague, incomplete and misleading without additional qualifying facts.

	existing on both sides of the Mississippi-Tennessee state line. Langseth Dep. Ex. 1, at C-3 – C- 5.	MERAS Table 1; Spruill Report at Figure 4; MERGWS at 15, 21, 24-26, 42-44; Paper 448-D, at D18; USGS Scientific Investigations Map 3014 (2007). It does not identify "Every USGS numerical (computer) model," and neither of the referenced reports or models designate their work as the Memphis- Sparta Aquifer model. MERAS; Brahana and Broshears (2001); Paper 448-D, at D18; USGS Scientific Investigations Map 3014 (2007).
D71	USGS potentiometric surface maps of the Memphis-Sparta Aquifer in the Tennessee-Mississippi border region represent the Memphis- Sparta Aquifer as existing on both sides of the Mississippi-Tennessee state line. Langseth Dep. Ex. 1, § 2.3, at 10-13.	**Response**: Disputed. Mississippi objects to Defendants' definition and use of Memphis-Sparta Aquifer. Mississippi also objects to Defendants' statement of fact as overly broad, vague, incomplete and misleading without additional qualifying facts. MERAS Table 1; Spruill Report at Figure 4; MERGWS at 15, 21, 24-26, 42-44; Paper 448-D, at D18; USGS Scientific Investigations Map 3014 (2007). Mississippi recognizes the Brahana and Broshears model as the best available USGS groundwater model for estimating natural pre-development groundwater directional flow within the Memphis Sand and the Sparta Sand aquifers in the Tennessee-Mississippi border region, and the estimated impact of pumping in Tennessee at and near the border.
D72	Pumping groundwater from the Memphis-Sparta Aquifer in one state can impact the groundwater in	**Response**: Disputed. Mississippi objects to Defendants' definition and use of Memphis-Sparta

	that same Aquifer in another state. Wiley Dep. 16:4-8; Langseth Dep. Ex. 1, § 3.4, at 20-22; Waldron Dep. Ex. 1, at 12.	Aquifer and the Aquifer. Mississippi also objects to Defendants' statement of fact as overly broad, vague, incomplete and misleading without additional qualifying facts. Whether groundwater pumping in a hydrologically connected aquifer in one State has an impact across the border in another State depends on specific geology and groundwater hydrology surrounding the well(s); the location of the well(s) relative to the common border; the size of the well bore(s) and the pump(s) being used; the amount of groundwater withdrawn from the well(s); and the duration of pumping at constant pumping rate(s). Spruill Dep. at 227-29; Waldron Dep. at 156-58; Wiley Report at 6-7. Without waiving its objections, Mississippi acknowledges that subject to all of the factors listed, pumping groundwater from an aquifer in one state within a specified distance from the border of another state will likely have some theoretical or actual impact in the other state.
D73	Pumping from the Memphis-Sparta Aquifer in Tennessee can affect groundwater in the Aquifer in Mississippi by changing its potentiometric surface and flow direction. Spruill Dep. 38:10-39:4; Larson Dep. Ex. 1, at 10; Wiley Dep. 16:9-13.	**Response**: Disputed as phrased but undisputed in part. Mississippi objects to Defendants' definition and use of Memphis-Sparta Aquifer and the Aquifer because it distorts and confuses the facts by its overbreadth. It is undisputed that pumping from the Memphis Sand in Tennessee has created a massive cone of depression in Mississippi, significantly drawing down the potentiometric surface in the Sparta

		Sand aquifer in Mississippi, and changing the natural groundwater flow direction from east to west towards the north into Tennessee. Wiley Report at 4-6; Spruill Rebuttal at 16. Mississippi also objects to Defendants' statement of fact as overly broad, vague, incomplete and misleading without additional qualifying facts. Whether groundwater pumping in a hydrologically connected aquifer in one State "affects" groundwater across the border in another State depends on specific geology and groundwater hydrology surrounding the well(s); the location of the well(s) relative to the common border; the size of the well bore(s) and the pump(s) being used; the amount of groundwater withdrawn from the well(s); and the duration of pumping at constant pumping rate(s). Spruill Dep. at 227-29; Waldron Dep. at 156-58; Wiley Report at 6-7. Without waiving its objections, Mississippi acknowledges that subject to all of the factors listed, pumping groundwater from an aquifer in one state within a specified distance from the border of another state will likely have some theoretical or actual impact in the other state.
D74	Pumping from the Memphis-Sparta Aquifer in Mississippi can affect groundwater in the Aquifer in Tennessee by changing its potentiometric surface and flow direction. Spruill Dep. 38:10-39:4; Larson Dep. Ex. 1, at 10.	**Response**: Disputed. Mississippi objects to Defendants' definition and use of Memphis-Sparta Aquifer and the Aquifer. Mississippi also objects to Defendants' statement of fact as overly broad, vague, incomplete and misleading without additional

		qualifying facts. Whether groundwater pumping in Mississippi can, or does "affect" groundwater in Tennessee by appreciably lowering the potentiometric surface and natural flow direction in Tennessee will depend on the specific geology and groundwater hydrology surrounding the pumping well; the location of the well relative to the Tennessee border; the size of the well bore and the pump being used; the amount of groundwater withdrawn from the well; and the duration of pumping at a constant pumping rate from the well. Spruill Dep. at 227-29; Waldron Dep. at 156-68; Wiley Report at 6-7). Without waiving its objections, Mississippi acknowledges that subject to all of the factors listed, pumping groundwater in Mississippi within a specified distance from the Tennessee border will likely have some theoretical or actual impact in the other state.
D75	Pumping from the Memphis-Sparta Aquifer in Shelby County, Tennessee, affects the groundwater in the Aquifer beneath DeSoto County, Mississippi, by changing its potentiometric surface and flow direction. Wiley Dep. 16:9-13; Spruill Dep. 38:10-15.	**Response**: Disputed. Mississippi objects to Defendants' definition and use of Memphis-Sparta Aquifer and the Aquifer. Mississippi also objects to Defendants' statement of fact as overly broad, vague, incomplete and misleading without additional qualifying facts. Spruill Dep. at 227-29; Waldron Dep. at 156-68; Wiley Report at 6-7). Without waiving its objections to this Proposed Statement of Fact as a universally true statement, Mississippi agrees that the massive municipal and industrial pumping in

		Tennessee has materially drawn down the potentiometric surface within the Sparta Sand within Mississippi and changed the natural groundwater flow direction across northwest Mississippi. Wiley Report at 5-8, 18-19; Waldron Dep. at 150-54; Gentry Dep. at 22-24.
D76	Pumping from the Memphis-Sparta Aquifer in DeSoto County, Mississippi, affects the groundwater in the Aquifer beneath Shelby County, Tennessee, by changing its potentiometric surface and flow direction. Wiley Dep. 17:11-15; Langseth Dep. Ex. 5, § 2.1.3, at 5-7.	**Response**: Disputed. Mississippi objects to Defendants' definition and use of Memphis-Sparta Aquifer and the Aquifer. Mississippi also objects to Defendants' statement of fact as overly broad, vague, incomplete and misleading without additional qualifying facts. Spruill Dep. at 227-29; Wiley Report at 6-7. Factually, Mississippi states that pumping in DeSoto County, Mississippi, has had some theoretical impact on potentiometric pressure across the border within Tennessee, it has not materially offset the withdrawal of Mississippi groundwater into Tennessee by Tennessee pumping.
D77	Pumping from the Memphis-Sparta Aquifer in DeSoto County, Mississippi, affects the flow of groundwater in the Aquifer from Mississippi into Shelby County, Tennessee. Wiley Dep. Ex. 1, at 17; Spruill Dep. Ex. 1, at 30-31; Langseth Dep. Ex. 5, § 2.1.3, at 6-7.	**Response**: Disputed. Mississippi objects to Defendants' definition and use of Memphis-Sparta Aquifer and the Aquifer. Mississippi also objects to Defendants' statement of fact as overly broad, vague, incomplete and misleading without additional qualifying facts. Spruill Dep. at 227-29; Wiley Report at 6-7. Factually, Mississippi states that pumping in DeSoto County, Mississippi, has had some theoretical impact on potentiometric pressure across the border

		within Tennessee, but it has not materially offset the withdrawal of Mississippi groundwater into Tennessee by Tennessee pumping. Brahana & Broshears (2001).
D78	Pumping from the Memphis-Sparta Aquifer in Mississippi affects the groundwater in the Aquifer beneath Arkansas and Louisiana. Langseth Dep. Ex. 1, § 3.4.2, at 21-22.	**Response**: Disputed. Mississippi objects to Defendants' definition and use of Memphis-Sparta Aquifer and the Aquifer. Mississippi also objects to Defendants' statement of fact as overly broad, vague, incomplete and misleading without additional qualifying facts. Spruill Dep. at 227-29; Wiley Report at 6-7; USGS Scientific Investigations Map 3014 (2007).
D79	Pumping from the Memphis-Sparta Aquifer in Arkansas affects the groundwater in the Aquifer beneath Mississippi and Louisiana. Langseth Dep. Ex. 1, § 3.4.2, at 21-22.	**Response**: Disputed. Mississippi objects to Defendants' definition and use of Memphis-Sparta Aquifer and the Aquifer. Mississippi also objects to Defendants' statement of fact as overly broad, vague, incomplete and misleading without additional qualifying facts. Spruill Dep. at 227-29; Wiley Report at 6-7; USGS Scientific Investigations Map 3014 (2007).
D80	Pumping from the Memphis-Sparta Aquifer in Louisiana affects the groundwater in the Aquifer beneath Arkansas. Langseth Dep. Ex. 1, § 3.4.2, at 21-22.	**Response**: Disputed. Mississippi objects to Defendants' definition and use of Memphis-Sparta Aquifer and the Aquifer. Mississippi also objects to Defendants' statement of fact as overly broad, vague, incomplete and misleading without additional qualifying facts. Spruill Dep. at 227-29; Wiley Report at 6-7; USGS Scientific Investigations Map 3014

		(2007) (shows Arkansas-Louisiana cross border impact in Sparta Sand almost 200 miles south of the Memphis Sand and over 40 miles from Mississippi)
D81	The regional cone of depression in the Memphis-Sparta Aquifer that extends beneath southwest Tennessee and northwest Mississippi is the cumulative result of pumping in both States. Wiley Dep. 86:11-16.	**Response**: Disputed. Mississippi objects to Defendants' definition and use of Memphis-Sparta Aquifer. Mississippi also objects to Defendants' statement of fact as overly broad, vague, incomplete and misleading without additional qualifying facts. Wiley Report at 5-8, 18-19, Figure 3 (describing and depicting extent of the cone of depression created by MLGW pumping only); Spruill Dep. at 227-29; Wiley Report at 6-7; Gentry Dep. at 10, 14-15, 20-24, 28-43, 77-79, 130-31, 138-41; Waldron Dep. at 150-51. Mississippi acknowledges that wells drilled within a specified distance of the Mississippi border will necessarily have some theoretical impact on the regional cone of depression created by the Tennessee pumping in the Memphis Sand, but Mississippi denies that pumping in Mississippi has materially contributed to this cone of depression in Tennessee. Spruill Dep. at 227-29; Wiley Report at 6-7; Brahana & Broshears (2001).
D82	Pumping centers in Mississippi have created cones of depression that extend into other states. Hoffman Dep. 27:1-5; Branch Dep. 39:11-14, 39:20-40:3.	**Response**: Disputed. Mississippi objects to Defendants' statement of fact as overly broad, vague, incomplete and misleading without additional qualifying facts. The cited testimony does not mention the aquifers at issue in this case, nor any other specific

		aquifer. Hoffman Dep. 27:1-5; Branch Dep. 39:11-14, 39:20-40:3. Mississippi also denies that pumping in Mississippi near the border of any state not intervening in this action should be considered.
D83	The Memphis-Sparta Aquifer is an interstate aquifer.[12] Langseth Dep. 132:23-133-1, Ex. 1, §§ 1.2, 3.1, at 2, 15, Ex. 1 generally; Larson Dep. 99:13-15, 100:1-6, 101:14-16, 102:3-5, 103:12-15, 104:3-4, 104:19-21; Waldron Dep. 89:5-8, 94:11-13, Ex. 1, at 12, 25; Spruill Dep. 107:2-17, 108:20-109:11, 109:23-110:9, 110:18-111:9.	**Response**: Plaintiff objects to Defendants' definition and use of Memphis-Sparta Aquifer. Plaintiff also objects to D83 to the extent it is a legal conclusion. Neither the Supreme Court nor Congress has ever defined "interstate aquifer." Further, the groundwater residing in the confined Sparta Sand formation within Mississippi's borders is an intrastate natural resource subject to protection, regulation and preservation only by the State of Mississippi. Wiley Report at 9-11; Wiley Rebuttal at 4; Miss. Code Ann. §§ 51-3-1, *et seq*.

[12] Pursuant to the Joint Case Management Order, Defendants have limited their statements to material issues of fact. To the extent the Court deems the question whether the Memphis-Sparta Aquifer is an interstate aquifer to be a mixed question of facts and law, it is included here.

III. STIPULATED FACTS FROM SECTIONS I AND II

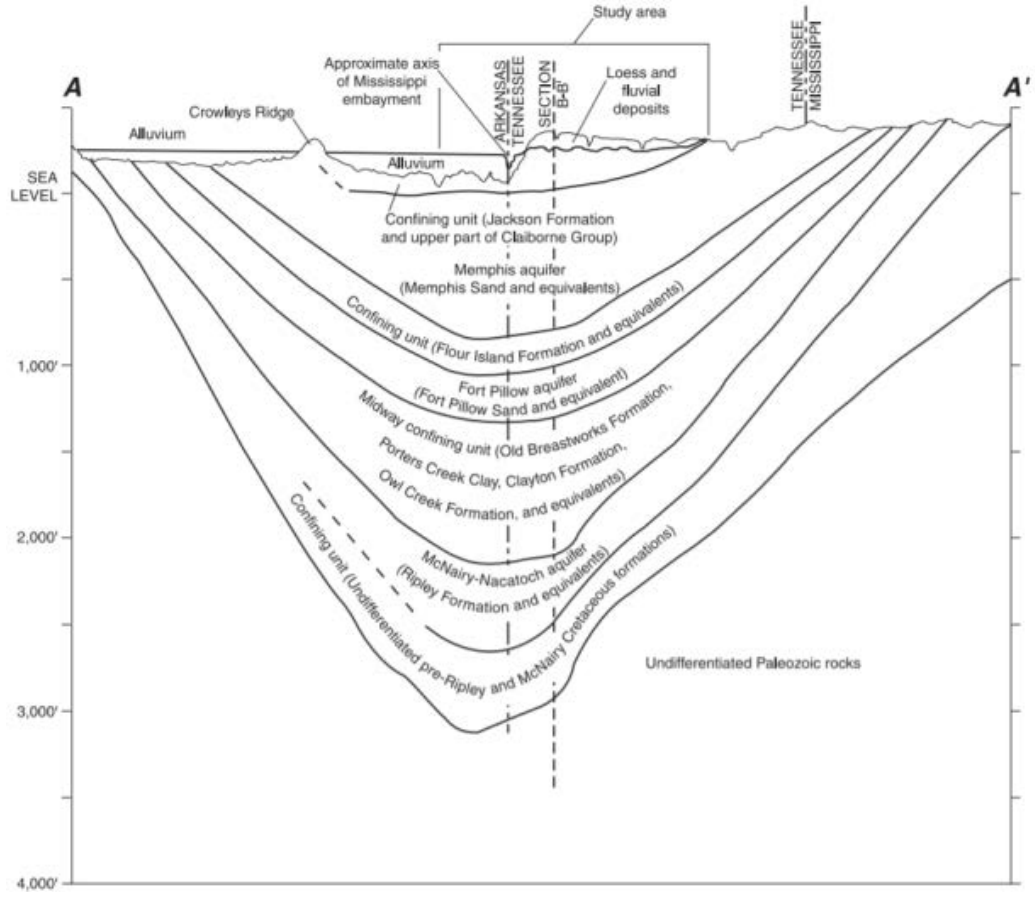
STIPULATED FACTS	
S1	Plaintiff, State of Mississippi ("Mississippi"), is a sovereign State of the United States of America (P1)
S2	Defendant State of Tennessee ("Tennessee") is a sovereign State of the United States of America. (P2)
S3	Defendant City of Memphis, Tennessee ("Memphis") is a municipal corporation and, as such, a political subdivision of Tennessee with respect to governmental functions, but not with respect to proprietary functions. (P3)
S4	Defendant Memphis Light, Gas & Water Division ("MLGW") is a division of Memphis. (P4)
S5	On December 10, 1817, the United States Congress admitted Mississippi as the twentieth state to the Union on an equal footing with the original thirteen colonies. (P5)
S6	On June 1, 1796, the United States Congress admitted Tennessee as the sixteenth state to the Union on an equal footing with the original thirteen colonies. (P6)
S7	Groundwater is a natural resource. (P9)
S8	The confined and unconfined sand formations spread throughout the Mississippi Embayment vary in geographic coverage, thickness, permeability, specific yield, water quality, and other characteristics. (P25)
S9	The Claiborne Group is a package of sediments deposited in the Mississippi Embayment approximately 40 million years ago during the middle of the Eocene Epoch of the Cenozoic Era. (P27)
S10	MLGW is a municipal utility selling water, gas, and electricity to customers in the Memphis area, including Shelby County, Tennessee. (P52)
S11	MLGW's groundwater pumping system currently consists of more than 160 wells in ten well fields, all located in Shelby County, Tennessee. (P54)

S12	The southern boundary of Shelby County is located on the Tennessee-Mississippi border and adjoins the northern boundary of Desoto County, Mississippi, and the northwestern boundary of Marshall County, Mississippi. (P55)
S13	MLGW's ten well fields are the Allen, Davis, Lichterman, LNG, Mallory, McCord, Morton, Palmer, Shaw and Sheahan fields. (P56)
S14	All of the wells in the Davis and Palmer well fields and most of the wells in the Lichterman well field are located within two to three miles of the Mississippi-Tennessee border on the Tennessee side. (P57)
S15	The groundwater pumped by MLGW in Shelby County from the Memphis Sand is, on average, 2,000-3,000 years old. (P68)
S16	A report published by the United States Geological Survey in 1964 in cooperation with the City of Memphis, Memphis Light, Gas, and Water Division, reported that at that time MLGW had five well fields pumping from the Memphis Sand. (P78)
S17	"Aquifer" means a formation, group of formations, or part of a formation that contains sufficient saturated, permeable material to yield usable quantities of water to wells and springs. (D1)
S18	"Cone of depression" is an area of lower potentiometric head surrounding an active pumping well that is caused by pumping (with the lowest potentiometric head being at the well). (D2)
S19	"Confined aquifer" or "confined area of an aquifer" is an aquifer or area of an aquifer that has an overlying confining layer and in which the pressure in the aquifer is high enough that the potentiometric head in the aquifer rises above the bottom of that confining layer. (D3)
S20	"Confining layer" means a formation of consolidated or unconsolidated sediments having very low hydraulic conductivity (i.e., low permeability) that restricts the movement of groundwater either into or out of adjacent aquifers. (D4)

S21	"Discharge" is commonly used to refer to water that moves out of an aquifer. (D5)
S22	"Equipotential line" means a line on a map along which the potentiometric head is estimated to be the same. (D6)
S23	"Flow path" or "flow line" means the average, idealized path followed by particles of water as they move through the aquifer. (D7)
S24	"Mississippi Embayment" is the northern portion of the Gulf Coast regional trough in the Paleozoic rocks that has filled with sediments during subsequent geologic periods, with alternating periods of land and ocean environments. The axis of the Mississippi Embayment is generally coincident with the Mississippi River; the northern extent of the Mississippi Embayment is approximately where the Ohio River joins the Mississippi River; and the southern extent is in southern Mississippi and central Louisiana. (D9)
S25	"Outcrop area" is the area of an aquifer that has no confining layer above and comes close to the surface or comes to the surface. The outcrop area can function as a recharge zone. (D10)
S26	"Potentiometric head" is the elevation to which water rises inside a tightly cased, properly screened well at a given location in an aquifer. (D11)
S27	"Potentiometric surface" is a representation of the potentiometric head of an aquifer over a region and is often represented in terms of lines of equal potentiometric head, commonly called contour lines. (D12)
S28	"Recharge" means water that moves into an aquifer. One example of recharge is rainfall that seeps through the ground into an aquifer. (D14)
S29	"Unconfined aquifer" or "unconfined area of an aquifer" means an aquifer or area of an aquifer in which the potentiometric head is below the overlying confining layer or in which the overlying confining layer is not present. (D16)
S30	Groundwater generally flows from areas of higher potentiometric head to areas of lower potentiometric head. (D21)

S31	Groundwater generally flows perpendicular to equipotential lines in the direction of decreasing potentiometric head. (D22)
S32	Cones of depression for pumping wells can overlap and combine, deepening the cone in the area of overlap. (D24)

S33	In cross-section, the Mississippi Embayment has alternating layers of aquifers and confining units. Below is a USGS illustrated cross-section of the Mississippi Embayment's stratigraphy in the area of the Tennessee-Mississippi state line. Note: Vertical scale greatly exaggerated. (D29)



S34	All of Memphis Light, Gas & Water Division's wells are physically located entirely within Tennessee. (D63)
S35	Groundwater wells in Mississippi and Tennessee are drilled straight down. There are no wells in either State that are drilled at a slant so that part of the pump or well physically crosses the Mississippi-Tennessee state line. (D64)

Respectfully and jointly submitted, this 27th day of February, 2018:

/s C. Michael Ellingburg
Lead Counsel for Plaintiff State of Mississippi

/s David C. Frederick
Lead Counsel for Defendant State of Tennessee

/s Leo M. Bearman
Lead Counsel for Defendants City of Memphis and Memphis Light, Gas & Water Division

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 have been served by electronic mail.

/s/ David C. Frederick
David C. Frederick