No. 141, Original

IN THE
SUPREME COURT OF THE UNITED STATES

STATE OF TEXAS,

Plaintiff,

v.

STATE OF NEW MEXICO and
STATE OF COLORADO,

Defendants.

OFFICE OF THE SPECIAL MASTER

STATE OF NEW MEXICO'S *DAUBERT* MOTION *IN LIMINE* TO EXCLUDE OPINIONS OFFERED BY DR. GEORGE HORNBERGER

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July 20, 2021

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COMES NOW the State of New Mexico ("New Mexico") and respectfully moves *in limine* to exclude the opinions and testimony of Texas's expert, Dr. George M. Hornberger, under Rule 702 of the Federal Rules of Evidence and *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 509 U.S. 579 (1993) and its progeny.

BACKGROUND

1. Texas expert Dr. William Hutchison developed the Texas groundwater model ("Texas Model"). New Mexico's experts identified multiple critical shortcomings of the Texas Model.
2. As described in New Mexico's separately filed *Daubert Motion in Limine to Exclude Opinions Offered by Dr. William Hutchison*, the Texas Model has several shortcomings, including that the model ignores the Project operations that dictate the surface flows in the Rio Grande and fails to model or account for the impacts of Texas pumping in the Hueco Bolson.
3. Rather than addressing any of the substantive issues or correcting any of the errors in the Texas Model that New Mexico's experts identified, Texas disclosed Dr. Hornberger as a rebuttal witness to defend the Texas Model and Dr. Hutchison's approach to developing that model. Exhibit A, *Expert Report of Dr. George M. Hornberger, Rebuttal Report on New Mexico Experts' Critique of Texas Groundwater Model* (Dec. 30, 2019) (Cover and Table of Contents) ("*Hornberger Expert Report*").
4. In his expert report, only six pages of which are dedicated to his substantive opinions, Dr. Hornberger concludes that New Mexico's evaluation of the Texas Model "lacks merit" and that Dr. Hutchison produced a model that meets Texas's objectives in this case. *Id*. In reaching this conclusion, Dr. Hornberger did not address several of the specific criticisms levelled by New Mexico's experts. Rather, Dr. Hornberger viewed New Mexico's criticism that modeling Project operations was required to properly represent the relevant hydrologic processes as

unfounded because information about reservoir management decisions are "unknowable." *Id*. Dr. Hornberger also asserted that the Texas Model did not need to account for Texas's groundwater pumping because it had very little effect on the flow of the Rio Grande above the El Paso gage. *Id*.

5. During his deposition, it came to light that Dr. Hornberger spent very little time ("two hours") reviewing the New Mexico experts' criticisms of the Texas Model, did not review all of New Mexico's expert reports responding to the Texas Model, did not fully review Dr. Hutchison's expert report, did not review the Texas model, did not review the New Mexico Integrated Lower Rio Grande Model (or the associated groundwater models), and did not have a basic knowledge of Project operations. *See* Exhibit B, *Deposition of Dr. George Hornberger* (May 22, 2020) ("*Hornberger Depo. Tr.*"). Dr. Hornberger explained that he:
    a. Spent a total of two hours reviewing New Mexico's expert reports. *Id*. at 127:4-17.
    b. Only reviewed summaries of New Mexico's expert reports. *Id*. at 127:18-22.
    c. Did not review the expert report of New Mexico's expert Dr. Barth, who provided many of New Mexico's substantive criticisms of the Texas Model. *See id*. at 127:4-129:20.
    d. Never reviewed in detail or ran the Texas Model. *Id*. at 144:10-22.
    e. Never reviewed the entirety of Dr. Hutchison's expert report. *Id*. at 148:18-149:10.
    f. Never reviewed in detail or received the model files for New Mexico's Integrated Lower Rio Grande Model. *Id*. at 151:2-14.
    g. Did not understand how Reclamation releases water from the Project. *Id*. at 140:3-6.
    h. Did not know how Reclamation determines Project allocations to EBID in New Mexico or EP1 in Texas. *Id*. at 140:7-10.

i. Had not researched the significance of Reclamation's 57/43 Project allocation to EBID and EP1. *Id*. at 141:12-15.

j. Did not study how water is accounted for and delivered to Mexico or the City of El Paso. *Id*. at 142:1-7.

k. Had not had any discussions with personnel from Reclamation regarding how Reclamation operates Elephant Butte Reservoir or how EBID or EP1 order water from the reservoir. *Id*. at 188:9-16.

l. Was only aware of the definition of a "full supply" allocation from the Project because he listened in to another deposition, well after his expert report was disclosed. *See id*. at 142:17-143:3.

m. Did not have any specific knowledge of the effects of a non-full supply on Project allocations to EBID and EP1. *Id*. at 143:4-8.

n. Did not review any details of the Hueco Bolson aquifer. *Id*. at 163:20-24.

o. Did not know any details of the Project delivery points. *Id*. at 174:24-175:4.

p. Did not "know enough about the system" to answer whether groundwater pumping below the El Paso gage in Texas could affect Project deliveries to Texas below the El Paso gage. *Id*. at 178:15-23.

q. Had only a "loose understanding" of the D1/D2 allocation method and that it "guide[s] release levels." *Id*. at 186:12-24.

r. Had not reviewed or studied the D1/D2 method except seeing it on slides and presentations and could not say how it was developed or what years it governed Project allocations. *Id*. at 186:12-187:16.

s. Did not "know any details at all" about the 2008 Operating Agreement and had not reviewed the agreement to understand how it affects reservoir releases. *Id*. at 187:17-188:8.

6. Dr. Hornberger does not appear on Texas's Witness List. However, Texas has declined to confirm whether it will call Dr. Hornberger as a rebuttal witness at trial. Accordingly, New Mexico is filing this Motion to preclude Texas from introducing Dr. Hornberger's opinions on rebuttal.

LEGAL STANDARD

Under Rule 702 of the Federal Rules of Evidence, "the trial judge acts as a 'gatekeeper' screening evidence for relevance and reliability." *Polski v. Quigley Corp*., 538 F.3d 836, 838 (8th Cir. 2008) (citing *Daubert v. Merrell Dow Pharm., Inc.*, 509 U.S. 579, 589 (1993)). The party offering the expert testimony has the burden to show, among other things, that (1) the expert's testimony is based on sufficient facts or data, (2) the testimony is the product of reliable principles and methods, and (3) the witness reliably applies the principles and methods to the facts of the case. Fed. R. Evid. 702.

The importance of the trial court's "gatekeeping" responsibility under Rule 702 and *Daubert* cannot be overstated. As the Supreme Court has characterized it, "[T]he objective of that requirement is to ensure the reliability and relevancy of expert testimony. It is to make certain that an expert, whether basing testimony upon professional studies or personal experience, employs in the courtroom the same level of intellectual rigor that characterizes the practice of an expert in the relevant field." *Kumho Tire Co. v. Carmichael*, 526 U.S. 137, 152 (1999). The question of

whether an expert's testimony is reliable depends on the facts and circumstances of the particular case. *Id.* at 158.

ARGUMENT

I. Dr. Hornberger's Opinions Should be Excluded Because They Are not Based on Sufficient Facts and Data and Are Purely Speculative.

A. Dr. Hornberger's Opinions Are Based on Two Hours Reviewing New Mexico's Expert Reports, a Limited Study of The Texas Model, and Almost No Understanding of Project Operations.

Experts must base their opinions on facts sufficient to form an adequate foundation for those opinions. Fed. R. Evid. 702(b); *Hathaway v. Bazany*, 507 F.3d 312, 318 (5th Cir. 2007). Courts must "separate[] expert opinion evidence based on 'good grounds' from subjective speculation that masquerades as scientific knowledge." *Glastetter v. Novartis Pharm. Corp*., 252 F.3d 986, 988–89 (8th Cir. 2001). "Expert testimony is inadmissible where . . . it is excessively speculative or unsupported by sufficient facts." *Barrett v. Rhodia, Inc*., 606 F.3d 975, 981 (8th Cir. 2010) (citing *Concord Boat Corp. v. Brunswick Corp*., 207 F.3d 1039, 1056-57 (8th Cir. 2000)). "Expert testimony that is speculative is not competent proof and contributes 'nothing to a legally sufficient evidentiary basis.'" *Concord Boat Corp*., 207 F.3d at 1057.

Courts have excluded expert opinions under Rule 702(b) where the expert conducted only a limited review of the documents, reports, and circumstances relevant to offering the opinion. In *Sprint Communications Company*, 302 F.Supp.3d 597, 624 (D. Del. 2017), the court determined in a patent infringement action that an expert's testimony was not based upon sufficient facts where the expert did not investigate the record in the case, the patents at issue, or the patents' file histories and did not present facts to support the expert's conclusions.

Similarly in *Campbell*, the court determined that an expert's testimony was not based upon sufficient facts where the expert relied on a summary of deposition testimony prepared by counsel and did not review other documents that were relevant to the issue at hand. *Campbell v. National Railroad Passenger Corp.*, 311 F. Supp. 3d 281, 301 (D.D.C. 2018). The Court concluded that such "blind reliance on 'facts' provided by plaintiffs' counsel . . . rendered his expert report unreliable." *Id*.; *see also Baker v. Anschutz Expl. Corp*., 68 F. Supp. 3d 368, 381 (W.D.N.Y. 2014) (excluding opinion that defendant's gas well was source of water well contamination where expert relied primarily on the proximity of the two wells and failed to investigate countervailing evidence in the record); *Parsi v. Daioleslam*, 852 F. Supp. 2d 82, 89 (D.D.C. 2012) (concluding that the facts and data relied upon by an expert were "patently insufficient" where the expert "read only an apparently haphazard selection of defendant's sources").

Here, Dr. Hornberger opines on the sufficiency of Dr. Hutchison's Model and the "meritless" criticisms of that model levelled by New Mexico's experts; yet Dr. Hornberger has only a minimal awareness of those criticisms, Dr. Hutchison's Model, or the larger context of Project operations and the Lower Rio Grande Basin.

Knowledge of Project operations is foundational to the type of expert opinion Dr. Hornberger attempts to offer. Texas's Compact apportionment is defined and limited by Project allocations and operations. Project operations respond to changing circumstances including Project storage, return flows in the river, and demands from EBID, EP1, Mexico, and the City of El Paso. Project operations do not respond to these changing circumstances ad hoc, but in a predictable fashion based on standard and long-established historical Reclamation practices, including equal per acre allotment of Project water, a 57/43 allocation between EBID and EP1, and operational rules implementing Reclamation's allocations and deliveries. Project deliveries

are now made to specific river headgates, and the Project operates to avoid excessive waste of water. *E.g.,* Exhibit C, *Deposition of Dr. Ian Ferguson* at 287:8-23 (Feb. 20, 2020). Project operators factor return flows into their calculations of the volume of water needed to be released so that the release from Project storage, when combined with the downstream return flows, is sufficient to meet water orders. When return flows increase, Reclamation reduces the reservoir releases to meet orders, and vice versa. *E.g.,* Exhibit D, *Deposition of Dr. Ian Ferguson* at 36:12 to 37:3, 169:10 to 170:14 (Feb. 19, 2020), attached.

Dr. Hornberger admitted he has almost no understanding of Project operations and how they impact the volume of water delivered to Texas. Dr. Hornberger did not know how Reclamation determines Project allocations to EBID and EP1, *id*. at 140:3-10, had not researched the significance of Reclamation's 57/43 allocations to EBID and EP1, *id.* at 141:12-15, did not look into how Reclamation accounts for and delivers Project water to Mexico or the City of El Paso, *id*. at 142:1-7, and had not had any discussions with personnel from Reclamation regarding how Reclamation operates Elephant Butte and Caballo Reservoirs or how EBID or EP1 order water from the Project, *id*. at 188:9-16.

Further, Dr. Hornberger was only familiar with the definition of a "full supply" allocation from the Project because he listened in on another deposition, well after his expert report was disclosed, *see id*. at 142:17-143:3, and did not know how less-than-full supplies affect Project allocation to EBID and EP1, *id*. at 143:4-8.

Nor did Dr. Hornberger demonstrate any knowledge of how and where deliveries are made to EBID and EP1 within the Project or the groundwater hydrology within Texas. He admitted he did not know any details of the Project delivery points, *id*. at 174:24-175:4, did not "know enough about the system" to answer whether groundwater pumping below the El Paso gage in Texas could

affect Project deliveries to Texas below the El Paso gage, *id*. at 178:15-23, and had not reviewed details of the Hueco-Bolson aquifer in Texas, *id.* at 163:20-24.

Additionally, Dr. Hornberger demonstrated an extremely limited understanding of Reclamation's D1/D2 Allocation procedures and the 2008 Operating Agreement that control Reclamation's Project allocations to EBID and EP1. He admitted he had only a "loose understanding" of the D1 and D2 curves and knew only that they "guide release levels." *Id*. at 186:12-24. Moreover, he had not reviewed or studied the D1 and D2 curves except on slides and presentations, could not say how they were developed, and did not know what years they governed allocations. *Id*. at 186:12-187:16. Likewise, Dr. Hornberger admitted he did not "know any details at all" about the 2008 Operating Agreement and had not reviewed the agreement to understand how it affects reservoir releases. *Id*. at 187:17-188:8. Dr. Hornberger's own admissions make clear that he has done next to nothing to understand Project operations and the Lower Rio Grande Basin—a foundation fundamental to forming an opinion on whether the Texas Model can meet its objectives in this case and to assess the strength of New Mexico's criticisms of that model.

Without this knowledge, Dr. Hornberger could not form an understanding of how Project operations affect Project deliveries to EP1 in Texas, let alone develop an informed opinion of whether it was possible or necessary to adequately model these operations. Without apprising himself of the relevant facts and data to form his opinions, Dr. Hornberger's opinions that it is impossible to model Project operations because those operations are "unknowable" and that they are irrelevant to hydrologic models needed to evaluate the claims in this case are based on nothing more than speculation. Dr. Hornberger should not be allowed to offer opinions on subjects he has not taken the effort to understand.

In addition to his lack of knowledge of Project operations, Dr. Hornberger does not have even a basic familiarity with the Texas Model—the model Texas tasked him to defend. Dr. Hornberger admitted he never reviewed the Texas Model in detail and never reviewed Dr. Hutchison's model files or even received them. *Id*. at 144:10-22. Nor did Dr. Hornberger even review Dr. Hutchison's expert report in its entirety. Dr. Hornberger stated that he reviewed the body of the report but not its technical appendices, which explain how the Texas Model works and expand on and provide the technical basis for the report's reasoning and conclusions. *Id*. at 148:18-149:10.

Perhaps most significantly, Dr. Hornberger expended minimal effort in trying to understand New Mexico's criticisms of the Texas Model. In his expert report, Dr. Hornberger disclosed that he "scanned" New Mexico's expert reports "but did not delve into the details of the models used." *Hornberger Expert Report* at 3. During his deposition, Dr. Hornberger revealed just how cursory his review of New Mexico's criticisms were:

> Q. -- and there's a number of entries here. It looks like you started by reviewing the New Mexico expert reports; is that correct?
>
> A. Yes.
>
> Q. Under that entry, there's just two hours. Did you spend more time than that reviewing the expert reports?
>
> A. No. I think, again, it was just a very high level. I probably just reviewed the summary -- summaries.
>
> Q. And so that -- that was the only time that you reviewed the reports, the New Mexico reports?
>
> A. I may have looked back for some clarification when I was preparing my report, but nothing in detail.
>
> Q. And you said you just reviewed the summaries for those reports; is that correct?

> A. I don't know. May have. I may have done more than that, but clearly, I didn't spend hours or days reviewing in great detail.
>
> Q. And which New Mexico expert reports did you review?
>
> A. I'd have to check back, but it was basically the ones that made explicit critiques to Bill Hutchison's report.

Hornberger Depo. Tr. at 127:4-128:2; *see also id*. at 128:3-129:20.

Not only did Dr. Hornberger merely scan summaries of New Mexico's experts' reports, it does not appear Dr. Hornberger even reviewed the report of New Mexico's expert Dr. Barth. *See id*. at 127:4-130:9. Dr. Barth provided many of New Mexico's criticisms of the Texas Model, criticisms that were not expressed in the summaries of New Mexico's criticisms Dr. Hornberger. *See* Exhibit E, *Expert Report of Gilbert R. Barth, Ph.D.* (Oct. 28, 2019) (excerpt) at 9-6 to 9-8. Those criticisms pointed out that Texas's Model had a number of technical flaws that limited its reliability. *Id*. Dr. Barth also provided further insight into why the Texas Model's use of an annual timestep further undermined its utility. *Id*. at 9-6. Dr. Hornberger did not review Dr. Barth's expert report and therefore could not have considered these criticisms in his opinions.

Nor did Dr. Hornberger, as part of his analysis of New Mexico's criticisms, review any part of New Mexico's Integrated Model in detail or even receive the model files to consider. Hornberger Depo. Tr. at 151:2-14. Therefore, Dr. Hornberger's criticism that the "complexity" of the New Mexico model was added "without presentation of any justification of what purpose is served by adding complexity," *Hornberger Expert Report* at 5, is unfounded because Dr. Hornberger did not review that model or the robust explanations New Mexico's experts provided of the model's design and purposes.

Dr. Hornberger's abbreviated review and understanding of the facts and circumstances relevant to his opinion—Project operations, Dr. Hutchison's Model, and New Mexico's criticisms

of that model—render his opinions unreliable. Like the excluded testimony in *Sprint Communications Company*, where the expert had not reviewed the patent or patent history at issue, 302 F.Supp.3d at 624, or in *Campbell*, where the expert had not reviewed documents relating to Amtrak's discipline decisions and discrimination-complaint procedures but instead relied on summaries of depositions, 311 F.Supp.3d at 301, Dr. Hornberger's "two-hour" review of summaries of some of New Mexico's criticisms is not enough to ground his opinions in sufficient facts and data as required by Rule 702(b). Dr. Hornberger cannot simply rely on his abstract knowledge of hydrologic modeling to deliver opinions on the merits of the Texas Model or New Mexico's criticisms of that model. *See Zamecnic v Indian Prairie School District No. 204*, 636 F.3d 874, 881 (7th Cir. 2011) (excluding expert's opinion based on 38-page expert report, 29 pages of which are "devoted to [expert's] impressive curriculum vitae," which established expertise, but expert's conclusion that students' speech in school would cause harm "comes out of nowhere"). For the foregoing reasons, the Special Master should exclude Dr. Hornberger's opinions as unreliable under Rule 702(b).

CONCLUSION

For the foregoing reasons, New Mexico respectfully moves the Special Master to enter an order excluding the opinions and testimony of Texas's expert Dr. George M. Hornberger.

Respectfully submitted,

/s/ *Jeffrey J. Wechsler*

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OFFICE OF THE SPECIAL MASTER

_____♦_____

STATE OF NEW MEXICO'S CERTIFICATE OF SERVICE

_____♦_____

This is to certify that on July 20, 2021, I caused a true and correct copy of the **State of New Mexico's *Daubert* Motion *in Limine* to Exclude Opinions Offered by Dr. George Hornberger** to be served by e-mail and U.S. Mail upon the Special Master and by e-mail upon all counsel of record and interested parties on the Service List, attached hereto.

Respectfully submitted this 20th day of July, 2021.

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EXHIBIT A

December 30, 2019

EXPERT REPORT OF:
Dr. George M. Hornberger

REBUTTAL REPORT ON NEW MEXICO EXPERTS' CRITIQUE OF TEXAS GROUNDWATER MODEL

In the matter of:

No. 141, Original
In the Supreme Court of the United States
State of Texas v. State of New Mexico and State of Colorado

Prepared for:

Somach Simmons & Dunn
500 Capitol Mall, Suite 1000
Sacramento, CA 95814

Prepared by:

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EXHIBIT A

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EXHIBIT A

Introduction

I was retained to examine the criticisms of the model analysis produced by Hutchison (2019) levelled in the expert reports produced by New Mexico. This report addresses three major criticisms of the Hutchison model:

- The model does not simulate uses of water between the El Paso gage and Ft. Quitman.
- The model does not use operational rules to simulate how releases from Caballo Reservoir might change in the future if pumping is reduced.
- The use of annual stress periods in the model does not allow distinction between the irrigation season and non-irrigation season.

I read the reports produced by Hutchison and scanned the reports produced by experts for New Mexico but did not delve into the details of the models used. Rather, I focused on a high-level review of the criticisms and their validity with respect to what Hutchison presented. My overarching conclusions are that the New Mexico criticisms lack merit and that Hutchison (2019) indeed followed appropriate modeling guidelines and produced a model that meets the stated objectives.

Qualifications

I currently hold an appointment as Distinguished University Professor at Vanderbilt University. I am the Director of the Vanderbilt Institute for Energy and the Environment (VIEE) with a shared appointment as the Craig E. Philip Professor of Engineering and as Professor of Earth and Environmental Sciences. I previously was a professor at the University of Virginia for many years where I held the Ernest H. Ern Chair of Environmental Sciences. I also have been a visiting scholar at the Australian National University, Lancaster University, Stanford University, the United States Geological Survey (USGS), the University of Colorado, and the University of California at Berkeley. I received my B.S. and M.S. from Drexel University and my Ph.D. in hydrology from Stanford University.

I have extensive experience in hydrology including designing field experiments, analyzing hydrological data, and creating and interpreting computer models. I have published more than 175 papers in refereed scholarly journals. I am senior author of a 2018 textbook on Water Resources, a 2014 textbook, Elements of Physical Hydrology, and of a 2006 graduate text, Numerical Methods in the Hydrological Sciences. According to Google Scholar, my works have been cited almost 20,000 times in publications by others, more than 5,000 times since 2014.

Overview

The critiques of the groundwater modeling approach (hereinafter "Texas model") taken by Hutchison (2019) from experts for New Mexico lack specificity. The Texas groundwater model focuses on modeling the impact of pumping groundwater in the Rincon and Mesilla Valleys on flow in the Rio Grande at El Paso using annual stress periods. In contrast, the models produced by New Mexico include a river flow routing model using RiverWare, include groundwater models of the Hueco Bolson in addition to the Rincon-Mesilla Valleys, use monthly stress periods, and use hypothetical reservoir releases in place of historical observations. The argument that these "improvements" to the model are necessary without presentation of any justification of what purpose is served by adding complexity, is completely opaque. Without justification in terms of the specific objectives stated for the model, such criticism is meaningless.

Well established guidelines for groundwater models require that model objectives be stated clearly at the outset so a fit-for-purpose model can be developed. As part of the model development process, the principle of parsimony is applied – that is, the model is constructed to provide accurate answers to questions connected to the stated objectives without being any more complex than necessary. These guidelines have been repeated consistently in many documents and are widely accepted in practice (see examples in **Table 1**). I will interpret the criticisms leveled in the reports from experts retained by New Mexico in the context of the generally accepted guidelines.

The objectives set forth for the Texas model by Hutchison (2019) are stated clearly and are straightforward. The goal is to show how groundwater pumping in the Rincon and Mesilla Valleys affects the amount of water that flows to Texas at the gage at El Paso. This is the key issue that needs to be addressed both to demonstrate the impact of pumping in New Mexico on water deliveries to Texas and to provide a simple and straightforward method to explore counterfactuals related to what deliveries would have been if pumping had been curtailed over the period of record. With this background, I will proceed to examine the main criticisms made by New Mexico's experts concerning the Texas model.

IN THE SUPREME COURT OF THE UNITED STATES
BEFORE THE OFFICE OF THE SPECIAL MASTER
HON. MICHAEL J. MELLOY

STATE OF TEXAS	)	
	)	
Plaintiff,	)	
	)	Original Action Case
VS.	)	No. 220141
	)	(Original 141)
STATE OF NEW MEXICO,	)	
and STATE OF COLORADO,	)	
	)	
Defendants.	)	

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REMOTE ORAL AND VIDEOTAPED DEPOSITION OF
DR. GEORGE HORNBERGER
MAY 22, 2020

****

REMOTE ORAL AND VIDEOTAPED DEPOSITION of DR. GEORGE HORNBERGER, produced as a witness at the instance of the Defendant State of New Mexico, and duly sworn, was taken in the above-styled and numbered cause on May 22, 2020, from 9:04 a.m. to 5:14 p.m., before Heather L. Garza, CSR, RPR, in and for the State of Texas, recorded by machine shorthand, at the offices of HEATHER L. GARZA, CSR, RPR, The Woodlands, Texas, pursuant to the Federal Rules of Civil Procedure and the provisions stated on the record or attached hereto; that the deposition shall be read and signed.

A. Yes.

Q. So, now, we're into November of last year --

A. Yes.

Q. -- and there's a number of entries here. It looks like you started by reviewing the New Mexico expert reports; is that correct?

A. Yes.

Q. Under that entry, there's just two hours. Did you spend more time than that reviewing the expert reports?

A. No. I think, again, it was just a very high level. I probably just reviewed the summary -- summaries.

Q. And so that -- that was the only time that you reviewed the reports, the New Mexico reports?

A. I may have looked back for some clarification when I was preparing my report, but nothing in detail.

Q. And you said you just reviewed the summaries for those reports; is that correct?

A. I don't know. May have. I may have done more than that, but clearly, I didn't spend hours or days reviewing in great detail.

Q. And which New Mexico expert reports did you review?

A. I'd have to check back, but it was basically

the ones that made explicit critiques to Bill Hutchison's report.

Q. But you don't recall which ones those were?

A. I don't recall the names of the people who did the reports. I obviously have that somewhere. They may be in my report in the list of references.

Q. I don't believe they are. So what I'm looking at is your expert report, and I see an entry for Dan Morrissey?

A. Right.

Q. For his expert report?

A. Yes.

Q. I don't see an entry for any other New Mexico expert reports. Is that the only one that you reviewed?

A. My recollection is that for this high-level review, we were having a meeting. I probably looked at several that were related to hydrology and read at least the summary and perhaps scanned reports.

Q. So you're provided opinions in your report criticizing the New Mexico expert reports and so I -- I am entitled to understand which reports you reviewed and which ones you have criticisms of, and they're not listed in your references. And so at this point, I -- the only one that's listed in your reference is the

Dan Morrissey report. So at this time do you recall whether or not there were any other reports that you reviewed?

MS. BARFIELD: Asked and answered.

A. The -- so I guess what I would want to point out is that I was not criticizing the New Mexico expert reports, per se. I was critiquing the criticisms that were levelled at the Hutchison report, and I think that they are at least all summarized in the Morrissey report. They may have originated from other reports, but the point is that they all are at least summarized in the Morrissey report.

Q. (BY MS. THOMPSON) Okay. Well, we'll look at the Morrissey report in a little bit and decipher then where you determined those criticisms. You believe that the three criticisms that -- that you have summarized in your report is Dan Morrissey?

A. I recall now, there was another report. Something engineering. So it was a report from Spronk Water Engineers.

Q. And what is it you're looking at right now?

A. So it's a report by Gregory K. Sullivan and Heidi M. Welsh October -- dated October 31, 2019, and the logo is Spronk Water Engineers Incorporated.

Q. Okay. And so you believe you reviewed their

report in total or the summary?

A. I certainly reviewed their report as it related to the criticisms level for the Hutchison report.

Q. Okay. What other reports did you review?

A. Again, I think that the summary criticisms are listed in that report. Was there another one is your question? I think that that may have been the main one that summarized the criticism.

Q. Okay. So looking back at your billing then -- and I should just clarify for the record. It appeared you were just looking at some files on your computer; is that correct?

A. Yes.

Q. Okay. And is that the folder where you keep all your materials related to this case?

A. Yes.

Q. Are there several sub folders within that folder?

A. Yes.

Q. Okay. So we'll come back to that later on. So back to the billing then. So on November, 2019, it looks like then you're preparing your report, and is that just your rebuttal report here that you're referring to when you say preparing report?

Reclamation operates the Elephant Butte reservoir?

A. I -- I really don't know.

Q. Do you have any understanding of how Bureau of Reclamation determines amount of water to be released each year from the project?

A. No.

Q. Do you know how Bureau of Reclamation determines allocations -- excuse me -- annual allocations to the two irrigation districts?

A. No.

Q. Do you understand how water is stored in Elephant Butte reservoir?

A. I'm not sure I understand your question. It is stored behind a dam.

Q. Sure. And I should have been more specific. What type of water is stored in Elephant Butte reservoir?

MS. BARFIELD: Question -- I mean, objection as to form; vague and ambiguous; calls for speculation; outside of the scope of this -- his testimony.

A. I'm at a loss. I don't mean to be flip, but I would say wet water.

Q. (BY MS. THOMPSON) Have you heard of the different types of water in Elephant Butte being

described as, you know, credit water or usable water or San Juan-Chama water?

A. I think when I was listening to the testimony on Monday that credit water was mentioned, but I don't really appreciate the distinctions you're making.

Q. Okay. So you've never looked into the accounting of the stored water within Elephant Butte to determine the difference, you know, accounting types of water? And when I say "accounting types," I mean the three I just mentioned?

A. I have not.

Q. Have you done any research into how -- when you mentioned the 57/43 rule, how that applies to the water stored in Elephant Butte reservoir?

A. No.

Q. And did you do any research into -- of the water that's released from Elephant Butte reservoir, where that water is delivered?

A. I mean, I -- I know that it gets delivered to the EBID and EP1, but -- and Mexico and El Paso, but no, not in any more detail than that.

Q. So you didn't look into how reservoir releases relate to orders from either of the two districts you just mentioned, EBID or EP1?

A. I did not.

Q. Did you do any research into how water is accounted for or delivered to Mexico?

A. I did not.

Q. And what about any research at all into how water would be released from Elephant Butte reservoir and delivered to the City of El Paso?

A. Again, no.

Q. Are you familiar with the term total usable water?

A. No.

Q. Are you familiar with the term a full supply as it relates to the Rio Grande project?

A. Yes. Again, I've come across that term, and it -- a certain number of acre-feet per year that would satisfy fully the demands of the different constituents.

Q. Do you know what that number of acre-feet per year is to meet the definition of a full supply?

A. Again, I think that when I was listening to the deposition on Monday that was mentioned that something around 740,000 acre-feet, but that's -- that's based on my recollection from Monday's deposition.

Q. Was Monday's deposition the first time you had heard about a full supply for the Rio Grande

project?

A. I may have heard about it in other meetings in previous years, but I don't recall.

Q. Do you have any understanding of how the non full supply year the Bureau of Reclamation allocates water to EBID or EP1?

A. Other than reducing the outflow, I don't have any specific knowledge.

Q. Is it your understanding that Bureau of Reclamation makes releases from the reservoir to meet downstream demands in the irrigation districts?

A. I think that that is correct.

Q. When you're looking at stream flows downstream of Elephant Butte irrigation districts, what is the source of the dominant stream flow? Is it tributary inflow or is it releases from the reservoir?

A. It's predominantly releases from the reservoir, I think.

Q. Have you looked into -- into that issue at all of how much of the stream flow is made up of releases versus other potential inflows?

A. Well, one time, I may have looked at those data, but I don't recall any details.

Q. Would you agree, though, that the dominant factor, though, is the releases from the reservoir

during the irrigation season?

MS. BARFIELD: Lacks foundation; calls for speculation; argumentative.

A. I -- I think that most of the water in the Rio Grande below Elephant Butte comes from upstream, so I guess the answer is yes.

Q. (BY MS. THOMPSON) When you say "upstream," do you mean from releases from the reservoir?

A. Yes.

Q. Did you review Dr. Hutchison's model in detail?

A. No.

Q. Why not?

A. I was not asked to review Dr. Hutchison's model in detail.

Q. Do you have a copy of his model files on your computer?

A. No.

Q. Have you ever received Dr. Hutchison's model files?

A. No. I don't think there was ever any reason that I would have.

MS. BARFIELD: So, Lisa, we've been going well over an hour. Why don't we take a break?

MS. THOMPSON: Sure. Absolutely. Okay.

bring him back for a full day. If we get to 5:00 and you think you have another half an hour or if you have another hour, we can discuss that, but not a full day.

MS. THOMPSON: So, again, Theresa, we will be calling Dr. Hornberger back because we won't finish by 5:00 and probably not by 5:30, although we'll do our best. You know, there are a number of things that we've been going over today that are very relevant to his expert qualifications and his expert testimony. So let's keep moving along here so that we're not --

MS. O'BRIEN: Excuse me. Lisa, I'm sorry. Theresa, I'm sorry to interrupt. This is Maria O'Brien. I just wanted to let the record reflect that Dr. Al Blair, the district engineer for EP No. 1, is on the line now.

MS. THOMPSON: Okay. Thank you, Maria.

Q. (BY MS. THOMPSON) All right. Dr. Hornberger, so we were just talking about, you know, your work on Dr. Hutchison's reports, and so did you review all of Dr. Hutchison 's report, including all of his tech memos?

A. No.

Q. And why not?

A. I was asked to review at a high level the

criticisms that were levelled at Dr. Hutchison's report. I read his report to understand at a high level what he had done, and that sufficed for me to finish the work I was asked to do.

Q. Okay. But just to be clear, though, did you review Dr. Hutchison's entire report itself and not the appendices or just sections of his report?

A. No. I reviewed the report itself.

Q. Okay. Did you review any of the appendices?

A. No.

Q. Okay. And, again, you state that you scanned the New Mexico reports, and I'm now back on your expert report, which is Exhibit 3, if you want to turn to that.

MS. BARFIELD: Is that a question?

Q. (BY MS. THOMPSON) So I'm on Page 4 now -- actually, sorry, let me go back to this. I am on Page 2 of your report.

A. Page 2 at the top or Page 2 of the report?

Q. It's, actually, the Page 3, PDF Page 3, and it starts, "Introduction." Do you see that?

A. Yes.

Q. Okay. So then the second paragraph there says, "I read the reports produced by Hutchison." Do you see that?

mainly the -- the Spronk report, and Morrissey.

Q. Thank you. And then on the next line, you talk about you did not delve into the details of the models used?

A. Correct.

Q. Did you receive the model files for the State of New Mexico modeling?

A. No.

MS. BARFIELD: Asked and answered.

Q. (BY MS. THOMPSON) And so when you say you didn't delve into the details, you never even received the models; is that correct?

MS. BARFIELD: Asked and answered.

A. That is correct.

Q. (BY MS. THOMPSON) And you mentioned that same paragraph there that, "My overarching conclusions are that the New Mexico criticisms lack merit." Do you see that?

A. Yes.

Q. How did you determine what the New Mexico criticisms were by looking at just the Spronk and the Morrissey report?

A. The criticism of the Hutchison report are listed in their reports.

Q. Did anybody tell you what the three

groundwater pumping is the reduction of groundwater elevations, also known as drawdown." Again, same -- same question: Is that -- would that be true throughout the entire Rio Grande project area, including the Hueco basin area?

MS. BARFIELD: Same objection.

A. These are, again, hydrological principles. If you pump water from a well, you cause drawdown.

Q. (BY MS. THOMPSON) So that would be true then throughout the entire Rio Grande project area?

A. It's true for any aquifer anywhere.

Q. Okay. So then the next statement, "This drawdown has resulted in a condition where the Rio Grande was generally gaining flow from the inflow of groundwater prior to 1950 to a condition where the Rio Grande generally is a losing stream that recharges the aquifer." Do you know if that statement is true for the Hueco basin, as well?

A. I do not know.

Q. In preparation of your opinions for this case, did you look at the Hueco basin, including the alluvial aquifer, for -- for any reason at all to establish your opinions?

A. No.

Q. On Dr. Hutchison's next question, he

Hutchison's report is that he was focused on the impact of pumping of groundwater in New Mexico and in Texas on flows in the Rio Grande.

Q. Measured at what point?

A. The -- the major -- as I said, a major focus was at El Paso.

Q. Okay. So -- so that is different then, a different objective then, to determine pumping impacts on the flow at El Paso than determining pumping impacts on deliveries of Rio Grande project water; would you agree with that?

A. So going back to what we discussed earlier, the flows at the Rio Grande are influenced very much by releases from Caballo.

Q. Agree. I don't -- I don't think that addresses my question, though.

A. Then I -- I don't understand your question, I guess.

Q. Sure. So if a -- you mentioned that the modeling objective from Hutchison is to be able to determine on a counter factual deliveries of Rio Grande project water, correct?

A. Yes.

Q. Okay. And under the Rio Grande project, there are delivery -- actual delivery points where the

accounting measures those delivery points. Are you aware of those delivery points?

A. I know that they exist, but I'm not aware in detail.

Q. Okay. If some of those delivery points are downstream of the El Paso gage, would it be relevant to understand what happens between the El Paso gage and those delivery points?

A. If one asks a question as to what happened below El Paso, of course.

Q. And here you -- one of the criticisms that you respond to is exactly that of whether or not the -- the model should be able to be on the El Paso gage; is that correct?

A. I think that was one of the criticisms that was levelled at the Hutchison model.

Q. Okay. And my understanding is, is that your opinion is that the model doesn't need to go through the El Paso gage; is that correct?

A. Hutchison was focused on the question about how flows at El Paso were impacted -- may have been impacted by groundwater pumping in New Mexico. So to the extent that what happens below El Paso has minimal influence on flow at El Paso, the answer is that Hutchison didn't need to do that.

Hutchison certainly accumulated in his report -- relied on in his report on the geology, the geology is such that the hydro-geological connection is pretty limited, and, in fact, in my opinion, Hutchison was pretty generous in the amount of flow that he allowed to go through the narrows and Fillmore Pass. So it's just -- you could change that number, but it -- it is dwarfed by the amount of water pumped in New Mexico and Texas.

Q. So reservoir releases, I think we talked about it before, are made based on demand downstream and into the irrigation district. Do you agree with that?

A. I believe that's right.

Q. Okay. And so if EP1 is making an order and calling for water and that water flows past the El Paso gage but then isn't, you know, officially delivered to the EP1 until some point further downstream or further into the canal system, would pumping between the El Paso gage and that delivery point potentially reduce the amount of delivery?

A. I don't think I know enough about the system to answer that question.

Q. Okay. But earlier, you said that you didn't think pumping in the Hueco had any significant impact

understanding of what the historical operations have been?

A. My understanding is really no more than I have said before. I would look at the observed releases from Caballo and conclude that they were a result of whatever the operations were over the years.

Q. What's your understanding then of how what's the maximum amount of release that Bureau of Reclamation would do at full supply year?

A. I would look at the data on releases and base an answer on that.

Q. Are you familiar at all with what's referred to sometimes as the D1 curve and the D2 curve?

A. I have a loose understanding of the D1 and D2 curves.

Q. Okay. Tell me what -- what your understanding is.

A. They're curves that guide release levels.

Q. And how do they guide release levels?

A. It's -- well, at the simplest, they are -- they can be shown as a graphical relationship between storage and water release.

Q. Anything else?

A. No.

Q. Do you know who developed the D1 and D2

curves?

A. No.

Q. Have you ever viewed or studied the D1/D2 curves?

A. I've seen them on slides and presentations.

Q. What was the reason to have them on slides and presentations?

A. Someone was discussing some aspect of flows in the Rio Grande at one of the meetings, I would assume. I think they were also brought up on the Monday deposition I was sitting in on.

Q. Dr. King's deposition, right?

A. Yes.

Q. Do you -- do you know when the D1 and D2 curves were applied for the Rio Grande project?

A. No.

Q. So what's your understanding of the 2008 operating agreement?

A. I don't know any details at all about it.

Q. Okay. Have you heard of the operating agreement before?

A. Yes.

Q. What have you heard about the 2008 operating agreement?

A. I've heard that there's a 2008 operating

agreement.

Q. Have you reviewed that to understand how reservoir releases are determined?

A. No.

Q. And so in --

A. Not that I recall. I -- you know, way back in 2014 or 2015, it is possible that I looked at that, but I don't recall.

Q. Did you have any discussions with anyone from Bureau of Reclamation about how they operate Elephant Butte Reservoir?

A. No.

Q. Did you have any discussions with either EBID -- excuse me -- EBID or EP1 about how they order water from the reservoir?

A. No.

Q. So in your report, you talk about management, and when you say management, I'm going to assume you mean management of the Rio Grande project as --

A. No.

Q. No, that's not correct?

A. No, that's not correct. It's in the context of this particular criticism, which was levelled at Hutchison for not providing a model for releases from Elephant Butte. I was talking there about the

IN THE SUPREME COURT OF THE UNITED STATES
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HON. MICHAEL J. MELLOY

STATE OF TEXAS	)	
	)	
Plaintiff,	)	
	)	Original Action Case
VS.	)	No. 220141
	)	(Original 141)
STATE OF NEW MEXICO,	)	
and STATE OF COLORADO,	)	
	)	
Defendants.	)	

****

ORAL AND VIDEOTAPED DEPOSITION OF
IAN FERGUSON
FEBRUARY 20, 2020
VOLUME 2

****

ORAL AND VIDEOTAPED DEPOSITION of IAN FERGUSON, produced as a witness at the instance of the Defendant State of New Mexico, and duly sworn, was taken in the above-styled and numbered cause on February 20, 2020, from 9:07 a.m. to 2:46 p.m., before Heather L. Garza, CSR, RPR, in and for the State of Texas, recorded by machine shorthand, at the offices of TROUT RALEY, 1120 Lincoln Street, Suite 1600, Denver, Colorado, pursuant to the Federal Rules of Civil Procedure and the provisions stated on the record or attached hereto; that the deposition shall be read and signed.

project supply to meet those demands; however, during wet hydrologic conditions, there may not be reservoir capacity to reduce releases, so it -- it depends on hydrologic conditions, reservoir storage, and operations at any given time.

Q. Does Reclamation try to operate the Rio Grande project within any range of waste as a goal?

A. My understanding is that when Reclamation operated the project, the goal was to minimize operational waste that could not be utilized downstream, so there were cases where water -- excess water and -- water in excess of delivery demands would be diverted into a canal system and later bypassed back to the river if it could be utilized downstream and contribute to diversions downstream. My understanding is that the goal was always to minimize operational waste that could not be utilized so that couldn't be re-diverted and utilized later. Under current operations, Reclamation no longer operates the canal systems, so the districts would have that role. In general, I believe the districts try to minimize operational waste. I am not aware of any specific target that the districts have.

Q. Okay.

MR. DUBOIS: Are you going to switch to

IN THE SUPREME COURT OF THE UNITED STATES
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HON. MICHAEL J. MELLOY

STATE OF TEXAS	)	
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VS.	)	No. 220141
	)	(Original 141)
STATE OF NEW MEXICO,	)	
and STATE OF COLORADO,	)	
	)	
Defendants.	)	

****

ORAL AND VIDEOTAPED DEPOSITION OF
IAN FERGUSON
FEBRUARY 19, 2020
VOLUME 1

****

ORAL AND VIDEOTAPED DEPOSITION of IAN FERGUSON, produced as a witness at the instance of the Defendant State of New Mexico, and duly sworn, was taken in the above-styled and numbered cause on February 19, 2020, from 9:11 a.m. to 4:50 p.m., before Heather L. Garza, CSR, RPR, in and for the State of Texas, recorded by machine shorthand, at the offices of TROUT RALEY, 1120 Lincoln Street, Suite 1600, Denver, Colorado, pursuant to the Federal Rules of Civil Procedure and the provisions stated on the record or attached hereto; that the deposition shall be read and signed.

operations.

Q. (BY MS. THOMPSON) And in a reduced pumping run, how would that impact stream flows at the El Paso gage?

A. In general, with the reduction in groundwater pumping, groundwater levels would remain higher. That would contribute to higher drain flows, reduced seepage losses from the Rio Grande channel and/or increase gains to the Rio Grande channel. So that would all contribute to an increase in available stream flow at the Rio Grande/El Paso stream gage.

Q. How would those increased flows at the El Paso gage relate to reservoir releases?

A. It would really depend on the specific circumstances.

Q. Okay. Is it your opinion that it would have no impact on reservoir releases?

A. No. Under some conditions, I think it would have an impact.

Q. And why would it have an impact?

A. It depends on the water demands and the allocations throughout the project. If there were -- if the increase in stream flow at the Rio Grande El Paso gage would result in a -- in flow above the amount of water that was required to meet demands then

there would probably have been a reduction in releases from the reservoir so that water was not sent downstream in excess of demands and thus wasted.

Q. Sure. And so releases are typically related to demands; is that your opinion?

A. Releases are re -- are related to both allocations and demands and available water supply.

Q. If you go back to the report, the second paragraph, the last sentence, it says, "Changes in irrigation practices for the types of crops grown in the Rincon and Mesilla basins including areas within the Rio Grande project had increased crop irrigation water requirements." Do you agree with that statement?

MR. DUBOIS: Objection; lack of foundation.

A. That is slightly outside my area of expertise, but it is consistent with other studies that I'm aware of.

Q. (BY MS. THOMPSON) In any of your other modeling work, have you had to include irrigated acreage in your modeling work?

A. Yes.

Q. And have you had to include crop distribution?

A. I do.

Q. Do you agree that this generally reflects the kind of a simplified version of the order sheet related to gains and losses?

MR. DUBOIS: Objection to the form of the question.

A. This appears to be a simplified representation of a project order sheet, but I have not done a detailed comparison between this and an actual project order sheet.

Q. (BY MS. THOMPSON) In this appendix, she describes adding a gain of 30 CFS to the Rio Grande and each of the sub reaches, and I'm looking at Page B-7, and it's the third full paragraph down. She says, "I added a gain of 30 CFS to the Rio Grande and each of the sub reaches. This change represents an increase in drain flow or other net increases in stream flow in the Mesilla Valley. The result of this change is shown in B.4. The increases in total gains by 60 CFS resulted in decrease in Caballo releases of 60 CFS." Do you see that section?

A. I do.

Q. Do you agree that adding gains within those sub reaches would relate back to reservoir releases?

A. In some conditions.

Q. Okay. And in what conditions would that occur?

A. That would occur if the water orders were being met by the current release, so the -- the orders were not constrained by the available supply, and there were sufficient capacity in the reservoir to reduce releases. So if the reservoir is near full, we might not reduce releases because the reservoir would become hazardously full.

Q. Okay. So the second part of that, the spill situation, is fairly infrequent --

A. Right.

Q. -- would you agree?

A. Hasn't happened in a while.

Q. Right. This simplified version of the order sheet, just to compare to the water order form, do you still have your operations manual there in front of you?

A. Somewhere here.

MR. DUBOIS: Talking about Exhibit 10?

A. Exhibit 10?

Q. (BY MS. THOMPSON) Yes. Thank you.

A. Yeah.

Q. If you turn to Figure 1 on Page 6, the Internet-based order form.

EXHIBIT E

Expert Report of
Gilbert R. Barth, Ph.D.

Re:
In the Matter of: No. 141 Original,
In the Supreme Court of the United States,
State of Texas v. State of New Mexico and the State of Colorado

Prepared for:
State of New Mexico

S.S. PAPADOPULOS & ASSOCIATES, INC.
Environmental & Water-Resource Consultants

October 28, 2019

3100 Arapahoe Ave, Suite 203, Boulder, Colorado 80303-1050 • (303) 939-8880

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9.3 Texas Model Hydrogeologic Framework and Limited Shallow Resolution

Schorr and Kikuchi (2019) developed model layers based on the primary formations and their thicknesses. The Texas Model groundwater system is represented as a four-layer aquifer system. The active portions of the model layers are bounded by the bedrock units that are assumed to be impermeable. Model layers are delineated as follows:

- Model layer 1 comprises the valley-fill/river alluvium deposits and upper Santa Fe (85 foot average thickness)
- Model layer 2 comprises the upper Santa Fe unit (500 foot average thickness)
- Model layer 3 comprises the middle Santa Fe unit (640 foot average thickness)
- Model layer 4 comprises the lower Santa Fe unit (average thickness of 560 feet)

This approach has similarity to the NMR-M model, cuing on the transition of alluvium to different Santa Fe formations. Calibration adjustment of hydraulic conductivity could allow for similarities in lateral-flow potential in the NMR-M and Texas models. The primary difference is with regard to shallow layering. The NMR-M model incorporates 4 layers within the first roughly 600 feet, compared to 2 layers in the Texas Model. This additional refinement may play a significant role in reproducing observed flows, vertical gradients and drawdowns, especially in areas exhibiting interbedding of fine-grained materials.

9.4 Texas Model Issues

9.4.1 Ignoring the Seasonal Fluctuations with Annual Stress Periods

The Texas Model uses annual timesteps, precluding the representation of seasonality, especially with respect to surface-water depletions and seasonal drought recovery opportunities. The decision to reduce temporal resolutions appears to reflect an orchestrated effort to reduce accurate representation of the physical system, ignoring the resulting inability of the Texas Model to reasonably represent anything other than Rio Grande flows at the El Paso gage. Extensive data sets including estimation of the Land Surface, Surface Water, Farm Water budgets were developed on a monthly basis *Schorr and Kikuchi* (2019). Observations of flows and water levels were collected and processed to provide sub-annual variability. To create annual inputs, *Hutchison*

(2019) had to convert inputs provided from his collaborators as well as any information extracted from the seasonal NMOSE model (*SSPA*, 2007).

Without seasonality the Texas Model cannot represent groundwater elevation fluctuations which typically vary several feet during the course of the year (see the monthly time series in Appendix B, Figure B-2, for a full set of monthly groundwater-elevation seasonality examples). More importantly, without seasonal fluctuations, drain flows are not activated: if groundwater elevations are simulated as annual averages the groundwater elevation will not have a seasonal rise and will not result in groundwater flowing into the drains. This process is exacerbated by using winter observations of groundwater elevations, which are typically even lower than annual average (see Section 9.5.1 "Using Midwinter Targets for a Model with Annual Stresses") as calibration targets. The net result of omitting seasonal fluctuations is best summarized by the Texas Model simulated drainflows, as discussed in the Section 9.6.2 "Underestimation of Drain Flows". The limited amount of groundwater seepage into drains simulated by the Texas Model demonstrates the lack of simulated groundwater elevation fluctuations. With annual stress periods these fluctuations cannot be represented.

9.4.2 Misrepresenting Transbasin Boundary Conditions

A constant head boundary more typically provides a reasonable approximation of pumping induced gradients for boundary conditions representing features such as large lakes or reservoirs, where groundwater pumping induced water-level changes are assumed to be negligible. For the Texas Model, a constant head boundary may be an appropriate choice for the Caballo Reservoir representation, however it seems more reasonable to incorporate boundary conditions at the other transbasin locations that have some representation of conductance limitations specific to those locations. Without these limitations, the boundary conditions are likely to be far too sensitive to water level changes, e.g., see Section 9.6.5 "Texas Model Transbasin Response to Conejos Médanos".

9.4.3 Tributary Inflows Inconsistent with Estimated Water Budgets

Hutchison implements tributary inflows that are approximately 15% lower than the budget values provided by *Schorr and Kikuchi* (2019). This difference probably reflects calibration

adjustments, is not documented, and it is not apparent whether other water budget adjustments were made to remain consistent with the *Schorr and Kikuchi* (2019) budget.

9.4.4 Inadvertent Assignment of Agricultural Surface Return Flows as Urban Return Flows

In the Texas Model, agricultural surface runoff (also referenced by *Hutchison* as "field level surface runoff") was incorporated by subtracting agricultural surface runoff from the terminal diversions, providing net farm diversions. *Hutchison* (2019) describes this adjustment on page 17 of Technical Memorandum 13. However, the Texas Model pre-processor AnnualFlows.f95 has an error in the code and inadvertently assigns the Mesilla urban runoff, averaging about 2,200 af/yr, to a variable representing Mesilla tributary flows, and the Mesilla agricultural surface runoff, averaging about 20,000 af/yr, to a variable representing Mesilla urban runoff. These flows are distributed to SFR segments associated with tributary inflow and urban runoff, respectively, and written to the Texas Model SFR package. The result of this error is that the volume of Mesilla agricultural surface runoff (1.6 MAF) is effectively added to the surface water system twice; thus, an extra 1.6 MAF is added directly to the Rio Grande.

9.4.5 Misrouting Canal Flows into Drains

Within the Texas Model, settings in the SFR network are configured in a manner allowing large amounts of flow from the canal system to move directly into the drains. While some amounts of flow from canals directly into drains may occur in the physical system, the canal system exists to deliver water to farm headgates and the amounts passing directly from canals to drains will typically be small compared to the amount of water in the system. The Texas Model, however, is configured so that large amounts of water pass through the entire canal system, without any diversion, and are then routed into drains. Much of this water should have seeped from canals into the shallow groundwater contributing to both seasonal groundwater elevation fluctuations and seepage into drains. These mechanisms are not represented in the Texas Model. This construction is a misrepresentation of the physical system.

Discussions with the State of New Mexico Lower Rio Grande Water Master (*Serrano*, 2019) confirm that while it is possible to have occasions for this sort of routing to occur, it is not