

No. 137, ORIGINAL

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IN THE  
SUPREME COURT OF THE UNITED STATES

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STATE OF MONTANA, Plaintiff

V.

STATE OF WYOMING

AND

STATE OF NORTH DAKOTA, Defendants

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BEFORE THE HONORABLE BARTON H. THOMPSON, JR.  
SPECIAL MASTER

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**Wyoming's Motion in Limine to Exclude Expert Testimony by Steven Larson**

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The State of Wyoming, through counsel, moves for an order excluding evidence or argument at trial provided by Montana's expert witness, Steven Larson, based upon his use of the 2002 BLM model described herein for the purpose of predicting depletions to stream flow in the Tongue River Basin. In support of this motion, Wyoming states as follows:

### **Background**

Montana designated an expert witness, Steven Larson, to provide testimony regarding his evaluations of groundwater use impacts on stream flow conditions within the Tongue River Basin, both historically and into the future. Larson Rpt. at 1. Mr. Larson estimated historical and future stream flow depletions using a groundwater model developed by the Bureau of Land Management. *Id.* at 4. However, the BLM model Montana is attempting to rely upon was not constructed to predict Tongue River stream depletions.

The BLM developed its model for a 2002 EIS regarding the Powder River Basin.<sup>1</sup> The stated purpose of the model was to evaluate impacts of coal bed methane (CBM) development on groundwater resources and recharge to the groundwater system. *Id.* "The model simulates interactions between rivers and adjacent shallow aquifers using 'constant head' nodes to represent major perennial streams like the Tongue River, and 'drain' nodes to represent major ephemeral streams." *Id.* at 4-18 (referring to Figure 4-6 at 4-27). The modelers understood that regional groundwater discharge is "relatively small and diffuse, and not readily discernible as stream baseflow." *Id.* at 4-2. They assumed that "most of the discharge is diffuse and may occur as underflow in the alluvium or be consumed by evapotranspiration so that it does not appear as

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<sup>1</sup> Applied Hydrology Associates, Inc. & Greystone Environmental Consultants, Inc., Technical Report Powder River Basin Oil and Gas Environmental Impact Statement, Groundwater Modeling of Impacts Associated with Mining and Coal Bed Methane Development in the Powder River Basin at 1-1 (Dec. 2002) (prepared for the BLM's Buffalo Field Office in Buffalo, WY) (hereinafter "BLM Report") (attached hereto as Exhibit A).

surface flow." *Id.* at 2-16. In short, the BLM did not design the model to predict Tongue River streamflow depletions as promoted by Mr. Larson. *See id.* at 1-1, 4-18.

The BLM modelers also cautioned that model had several limitations. BLM Rpt. at 4-36 to 4-37. One such limitation was the model's large size and regional focus:

[A]ny regional model of this size will involve limitations caused by the size of the grid nodes and the simplification of a complex hydrogeologic system necessary for creating the model. . . . The primary purpose of modeling a hydrologic system on a regional, basin-wide scale is to project impacts and compare alternatives. A regional model also can be used to estimate the mass water balance so that long-term gain or loss can be evaluated. The regional model is an adequate tool for a comprehensive determination of the effects of CBM development. *However, the results should be viewed in perspective with the scale, and a sub-regional or local area model should be used to help evaluate impacts on a smaller scale.*

*Id.* at 4-36 (emphasis added). Additionally, the modelers noted the lack of data as a limitation:

#### **4.8.4 Lack of Data in the Central and Western Parts of the Basin**

*There are a lack of data for observation wells, production, and geology for the Wasatch Formation away from established areas of development in the eastern portion of the basin. The model is limited and potentially skewed by the data that are available. Model results from areas of the basin that lack adequate calibration data should be considered only as a general indicator of potential impacts. The model should be updated and refined as new data become available.*

*Id.* at 4-37 (emphasis added); *see also id.* at 5-2, Figure 5-1 (identifying the locations of calibration wells for the model). The portion of the Tongue River Basin represented in the model is an area away from established areas of development in the eastern portion of the Powder River Basin. In such circumstances, the BLM modelers warned that the modeled results should only be considered as a general indicator of potential impacts.

The BLM model was not designed to predict CBM groundwater production impacts to Tongue River streamflow. Accordingly, Mr. Larson's use of the BLM model conflicts with accepted methodologies and strains the original model so far from its intended purpose and scope as to make his opinions inadmissible.

### Discussion

#### I. Standards governing the admission of expert scientific testimony.

In original jurisdiction cases before this Court, the Federal Rules of Evidence may be taken as guides. Sup. Ct. R. 17.2. The general standard against which to assess the sufficiency of expert testimony is established by Rule 702:

A witness who is qualified as an expert by knowledge, skill, experience, training, or education may testify in the form of an opinion or otherwise if: (a) the expert's scientific, technical, or other specialized knowledge will help the trier of fact to understand the evidence or to determine a fact in issue; (b) the *testimony is based on sufficient facts or data*; (c) the *testimony is the product of reliable principles and methods*; and (d) the *expert has reliably applied the principles and methods to the facts of the case*.

Fed. R. Evid. 702(emphasis added).

When faced with a proffer of expert scientific testimony, the Special Master "must *determine at the outset*, pursuant to [Fed. R. Evid.] 104(a), whether the expert is proposing to testify to (1) scientific knowledge that (2) will assist the trier of fact to understand or determine a fact in issue." *Daubert*, 509 U.S. at 592 (emphasis added). Scientific knowledge, the court explained, "implies a grounding in the methods and procedures of science" which must be based on actual knowledge and not "subjective belief or unsupported speculation." *Id.* In other words, "an inference or assertion must be derived by the scientific method . . . [and] must be supported by appropriate validation - ie. 'good grounds,' based on what is known." *Id.*

The *Daubert* standard ensures that the proffered evidence is both "reliable" and "relevant." *See Daubert*, 509 U.S. at 589. The reliability analysis begins with a "preliminary assessment of whether the reasoning or methodology underlying the testimony is scientifically valid and of whether that reasoning or methodology properly can be applied to the facts at issue[.]" *Synergetics, Inc. v. Hurst*, 477 F.3d 949, 955 (8th Cir. 2007) (citing *Daubert*, 509 U.S. at 592-593); *see also Dodge v. Cotter Corp.*, 328 F.3d 1212, 1221-1222 (10th Cir. 2003). The Court listed four nonexclusive factors that the trial court may consider in assessing reliability: (1) whether the opinion at issue is susceptible to testing and has been subjected to such testing; (2) whether the opinion has been subjected to peer review; (3) whether there is a known or potential rate of error associated with the methodology used and whether there are standards controlling the technique's operation; and (4) whether the theory has been accepted in the scientific community. *Id.* *Daubert's* general principles apply to all expert matters described in Rule 702, Fed. R. Evid. *Kumho Tire Company v. Carmichael*, 526 U.S. 137, 149 (1999).

The list is not exclusive, and district courts applying *Daubert* have broad discretion to consider a variety of other factors. *See Kumho Tire*, 526 U.S. at 150 ("[W]e can neither rule out, nor rule in, for all cases and for all time the applicability of the factors mentioned in *Daubert*, nor can we now do so for subsets of cases categorized by category of expert or by kind of evidence. Too much depends upon the particular circumstances of the particular case at issue."). In fact the Advisory Committee Notes to Rule 702 provide a non-exhaustive list of other relevant factors: (1) whether the expert is proposing to testify about matters growing naturally and directly out of research they have conducted independent of the litigation; (2) whether the expert has unjustifiably extrapolated from an accepted premise to an unfounded conclusion; (3) whether the expert has adequately accounted for obvious alternative explanations; (4) whether the expert is

being as careful as he would be in his regular professional work outside his paid litigation consulting; and (5) whether the field of expertise claimed by the expert is known to reach reliable results for the type of opinion the expert would give.

Generally, a court should focus on the experts' methodology rather than the conclusions that they generate. *See Daubert*, 509 U.S. at 595. However, the experts' conclusions are not immune from scrutiny: "A court may conclude that there is simply too great an analytical gap between the data and the opinion proffered." *General Electric v. Joiner*, 522 U.S. 136, 146 (1997) ("Nothing in either *Daubert* or the Federal Rules of Evidence requires a district court to admit opinion evidence that is connected to existing data only by the *ipse dixit* of the expert."). Regardless of the specific factors at issue, the purpose of the *Daubert* inquiry is always the same: "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*, 526 U.S. at 152.

Under *Daubert*, Montana need not prove that the expert is indisputably correct or that the expert's theory is "generally accepted" in the scientific community. *See Moore v. Ashland Chemical, Inc.*, 151 F.3d 269, 276 (5th Cir. 1998) (en banc). Instead, Montana must show that the method employed by the expert in reaching the conclusion is scientifically sound and that the opinion is based on facts which sufficiently satisfy Rule 702's reliability requirements. *E.g., In re Paoli R.R. Yard PCB Litig.*, 35 F.3d 717, 744 (3d Cir. 1994). "[A]ny step that renders the analysis unreliable . . . renders the expert's testimony inadmissible. This is true whether the step completely changes a reliable methodology or merely misapplies that methodology." *Id.* at 745.

## **II. Mr. Larson's testimony and opinions are inadmissible as a matter of law.**

The very nature of groundwater modeling and its often-intended regulatory purpose dictate responsible and accurate modeling consistent with accepted standards of scientific rigor and realistic interpretation. See National Judicial College & Dividing Waters, *Hydrologic Modeling Benchbook* at 49-52 (2010) (attached hereto as Exhibit B) (discussing American Society of Testing and Materials (ASTM) and USGS guidelines for modeling).<sup>2</sup> This is especially true of any quantitative predictive modeling application, as the accuracy of the predicted values is directly tied to both proper conceptualization and model calibration. Thomas E. Reilly & Arlen W. Harbaugh, *Guidelines for Evaluating Ground-Water Flow Models*, U.S. Geological Survey Scientific Investigations Rpt. 2004-5038, at 1-2, 23-24 (2004) (attached hereto as Exhibit C). In this case, Mr. Larson ignored proper and accepted modeling procedure. He misused the 2002 BLM model to predict streamflow depletions, as it was never designed to do so. BLM Rpt. at 1-1, 4-18. As a result, Mr. Larson's testimony is not reliable, as required by *Daubert* and Rule 702.

The BLM regional model is calibrated to head<sup>3</sup> changes. As stated earlier, the model simulates interactions between rivers and adjacent shallow aquifers using 'constant head' nodes to represent major perennial streams and 'drain' nodes to represent major ephemeral streams. BLM Rept. at 4-18. But, scientific literature repeatedly enunciates that model calibration solely to heads is insufficient for the prediction of streamflows, and the values derived from such a calibration are suspect—if even meaningful. See Exhibits D-G attached hereto. "If a model is required to predict the future impacts of groundwater extraction on river base flow with a high

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<sup>2</sup> Due to the fact that every groundwater model has different requirements—size and scale, regulatory imperative, level of detail, predicted impacts, environmental constraints, etc.—there exist no set rules for determining the 'correct' application of a model.

<sup>3</sup> The "head" is the elevation to which water will rise in a well that taps a particular geologic unit. Under unconfined conditions, the water table elevation and the head are equivalent.

level of confidence, the calibration should include a comparison of calculated groundwater fluxes into the river with measured or estimated fluxes (e.g. as inferred from base-flow analysis).” Barnett et al., *Australian groundwater modelling guidelines*, Waterlines Rpt. Series No. 82, at 15 (2012) (attached hereto as Exhibit D).<sup>4</sup> Mr. Larson's misuse of the BLM model which is only calibrated to heads results in model predictions that have little correspondence with physical reality.

Groundwater modeling studies conclude that a 'heads only' calibration will not produce reliable stream flow depletion predictions. “The addition of discharge data to the calibration led to substantial changes in parameter values (Table 3b), indicating, in accordance with published studies (Anderman et al. 1996), that the *model parameters derived from the heads only calibration were incapable of quantifying groundwater discharge.*” James E. Saiers et al., *Influence of Calibration Methodology on Ground Water Flow Predictions*, 42 *Ground Water*, no. 1, Jan.-Feb. 2004 at 32, 39 (emphasis added) (attached hereto as Exhibit E) (citing Evan R. Anderman et al., *Two-Dimensional Advective Transport in Ground-Water Flow Parameter Estimation*, 34 *Ground Water*, no. 6, Nov.-Dec. 1996 at 1001 (attached hereto as Exhibit F)). “Unlike predictions of hydraulic heads, predictions used in groundwater discharge depend on the types of data used during calibration. Discharge predictions made with parameters derived from the heads-only calibration are inaccurate.” Saiers et al., *supra*, at 41. “Reasonably accurate simulation of transient ground water discharge to a canal during the prediction period was obtained only when discharge data were used in model calibration.” *Id.* at 42.

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<sup>4</sup> The BLM modelers recognized the need to calibrate the model to baseflows: “One consideration in model calibration is that modeled groundwater discharge rates must be consistent with observations of groundwater discharges to surface drainages.” BLM Rpt. at 5-9. However, the only baseflow data referenced and used by the BLM modelers pertained to the Powder River. *Id.* Nowhere in their report do the modelers describe baseflow to the Tongue River, or impacts to the Tongue River.



Head-only calibration can also result in problems of non-uniqueness. Non-uniqueness describes a circumstance in which multiple combinations of parameters can produce the same model results—which then in turn can give wildly incorrect predictions. Reilly & Harbaugh, *supra*, at 21, 30. “When calibrating flow models in small watershed in northern Wisconsin using head data alone, we encountered problems of nonuniqueness.” Elizabeth Harrison Keating & Jean M. Bahr, *Using reactive solutes to constrain groundwater flow models at a site in northern Wisconsin*, 34 *Water Resources Research*, no. 12, Dec. 1998 at 3561 (attached hereto as Exhibit G). If a calibration is nonunique, there is no guarantee that the predictive model will provide accurate results when the model is stressed differently from calibrated conditions. Reilly & Harbaugh, *supra*, at 21, 30. In some cases, this extends to a situation in which the solution is so non-unique that parameters literally cannot be accurately determined. This was the case in a study done by Anderman et al., *supra*, where the efficacy of different parameter estimation mechanisms was evaluated using statistical methods. “The complete parameter correlations produced when head observations are used alone indicates it will be impossible to estimate parameters with head observations alone.” Anderman et al., *supra*, at 1006 (internal citation omitted).

Even though the BLM model is only calibrated to head changes in the Tongue River Basin, Mr. Larson chose to use the model to estimate streamflow depletions. However, a consensus of scientific literature concludes that such a model is inappropriate for Montana's purposes, and that the model's estimates of Tongue River depletions are unreliable. *See e.g.*, Sainers et al., *supra*, at 39; Anderman et al., *supra*, at 1006. This inherent unreliability is in addition to the modelers warnings regarding the regional scope of the model and the lack of data in the Tongue River Basin. Therefore, Mr. Larson's testimony based on his use of the BLM

model does not meet the requirement of reliability necessarily to be admissible. Fed. R. Evid. 702 (requiring that expert testimony is “based on sufficient facts or data”, and is “a product of reliable principles and methods”); *Daubert*, 509 U.S. at 594-95 (stating that the focus of inquiry under Fed. R. Evid. 702 is “the scientific validity and thus the evidentiary relevance and reliability of the principles that underlie a proposed submission”); *see also In re Paoli R.R. Yard PCB Litig.*, 35 F.3d at 745 (“[A]ny step that renders the analysis unreliable . . . renders the expert’s testimony inadmissible. This is true whether the step completely changes a reliable methodology or merely misapplies that methodology.”).

WHEREFORE the State of Wyoming requests that Mr. Larson be prohibited from giving expert opinions or testimony based upon his use of the 2002 BLM model to predict depletions to streamflows.

Dated this 30<sup>th</sup> day of September, 2013.

THE STATE OF WYOMING



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## CERTIFICATE OF SERVICE

The undersigned certifies that a true and correct copy of the foregoing was served by electronic mail and by placing the same in the United States mail, postage paid, this 30 day of September, 2013.

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