STATE OF NEW MEXICO
ENERGY, MINERALS AND NATURAL RESOURCES DEPARTMENT
OIL CONSERVATION COMMISSION

IN THE MATTER OF THE HEARING CALLED BY THE OIL CONSERVATION COMMISSION FOR THE PURPOSE OF CONSIDERING:	)	
APPLICATION OF THE NEW MEXICO OIL CONSERVATION DIVISION FOR REPEAL OF EXISTING RULE 50 CONCERNING PITS AND BELOW GRADE TANKS AND ADOPTION OF A NEW RULE GOVERNING PITS, BELOW GRADE TANKS, CLOSED LOOP SYSTEMS AND OTHER ALTERNATIVE METHODS TO THE FOREGOING, AND AMENDING OTHER RULES TO MAKE CONFORMING CHANGES; STATEWIDE	)	CASE NO. 14,015

OFFICIAL EXHIBIT FILE
COMMISSION HEARING
(3 of 15: Industry Committee Exhibits 1-10, Rebuttal Exhibit 5A, Rebuttal Exhibit 12)

BEFORE: MARK E. FESMIRE, CHAIRMAN
JAMI BAILEY, COMMISSIONER
WILLIAM OLSON, COMMISSIONER

November 5, 6, 7, 8, 9, 13, 14, 15, 16, 26, 27, 30, 2007;
December 3, 4, 6, 7, 10, 14, 2007; February 14, 2008;
March 12, 13, 2008

Santa Fe, New Mexico

This matter came on for hearing before the Oil Conservation Commission, MARK E. FESMIRE, Chairman, on November 5, 6, 7, 8, 9, 13, 14, 15, 16, 26, 27, 30, 2007; December 3, 4, 6, 7, 10, 14, 2007; February 14, 2008; and March 12, 13, 2008, at the New Mexico Energy, Minerals and Natural Resources Department, 1220 South Saint Francis Drive, Room 102, Santa Fe, New Mexico, Steven T. Brenner, Certified Court Reporter No. 7 for the State of New Mexico.

* * *

STEVEN T. BRENNER, CCR
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OIL CONSERVATION COMMISSION
CASE NO. 14015

Application of the Oil Conservation Division for Repeal of Existing Rule 50 concerning pits and below grade tanks and adoption of a new rule governing pits, below grade tanks, closed loop systems and other alternative methods to the foregoing, and amending other rules to conforming changes, Statewide.

PRE-HEARING STATEMENT AND EXHIBITS FOR THE NEW MEXICO INDUSTRY COMMITTEE

BP America Production Company, Inc.; Benson-Montin-Greer Drilling Corporation; Boling Enterprises, LTD; Burlington Resources Oil & Gas Company; Chesapeake Energy Corporation; Chevron USA Inc.; ConocoPhillips Company; Devon Production Company; Dugan Production Corporation, Energen Resources Corporation; Marathon Oil Company, Marbob Energy Corporation, Merrion Oil and Gas Corporation; Occidental Permian, LTD (including OXY USA, Inc. and OXY USA WTP Limited Partnership); Samson Resources Company; D. J. Simmons, Inc.; Williams Production Company, LLC; XTO Energy, Inc.; Yates Petroleum Corporation.

October 29, 2007

Daniel B. Stephens, Ph.D., P.Hg., R.G.

Specialization

Hydrogeology; fate and transport; allocation; applications of numerical models; aquifer contamination problems; vadose zone and aquifer monitoring.

Academic Degrees

Ph.D., Hydrology, University of Arizona, 1979

M.S., Hydrology, Stanford University, 1974

B.S., Geological Science (with honors), Pennsylvania State University, 1971

Professional Registration

Certified Professional Hydrogeologist No. 406, American Institute of Hydrology

Certified Hydrogeologist No. HG355, California

Registered Geoscientist No. 1767, Texas

Registered Geologist No. 5937, California

Registered Geologist No. 28483, Arizona

Registered Geologist No. 936, Idaho

Representative Professional Assignments

- Brine and NORM Contamination, Martha Oilfield, Kentucky
- Hydrogen Sulfide Contamination, Underground Gas Storage Facility, El Paso Natural Gas, Southern New Mexico
- Oil Field Brine Contamination, Paul Hamilton, Caprock, New Mexico
- Oil Field Brine Contamination, Cole Ranch, Property Damage Case, Midland, Texas
- Methane Contamination, Natural Gas Operations, Southwestern Colorado
- Oil Field Brine Contamination, Samson v ExxonMobil et al, Oklahoma
- Tar Sand/Asphalt Refinery Contamination, Cost recovery action, Oxnard Refinery, Oxnard, California
- Coal Tar, Insurance Coverage Case, Manufactured Gas Plant, Louisiana
- Regional Groundwater Model Development, Roswell Basin, New Mexico
- Water Budget Analysis, International Boundary and Water Commission, Arizona and California
- Water Bottling Facility, Determination of Source of Groundwater for the Springs and Production Wells and Evaluation of Whether the Produced Well Water Fit the Federal Definition of Spring Water, Crystal Geyser, Olancha, California
- Water Availability Study, Pacific Agricultural Holdings, Inc., Cadiz Basin, California
- Pepperdine University, Senior Hydrogeologist, Water Resource Management and Groundwater Monitoring, Malibu, California
- Water Rights Case, American Water Development Corporation, Great San Dunes National Monument, Colorado

Daniel B. Stephens, Ph.D., P.Hg., R.G.

- Nationwide Aquifer Yield Survey, U.S. Air Force, MX Missile Program
- Numerical Modeling for Water Resource Impacts, American Groundwater Consultants, Inc., Albuquerque, New Mexico
- Numerical Groundwater Flow Model, American Groundwater Consultants, Inc., Jemez Mountains, New Mexico
- Water Supply Analysis for Water Rights Transfer, Lea County, New Mexico
- Water Budget Study Review, New Mexico Environmental Evaluation Group, Waste Isolation Pilot Plant, Southeastern New Mexico
- Numerical Modeling for Water Supply Analysis, Andrews Ranch, Prewitt, New Mexico
- Oil Recycling Facility, CERCLA Cost Allocation, Morrison-Knudsen, Salt Lake City, Utah
- Oil Pipeline Spill, Fowler vs. ExxonMobil et al., Oklahoma
- Gasoline Refinery Contamination, Cost Allocation, Tosco Refinery, Texaco, Inc., Martinez, California
- MTBE Contamination Cost Allocation, Shell Oil Company, Southern California
- Chlorinated Solvents, CERCLA Cost Allocation, Zero Corporation, San Fernando Valley, California
- Chlorinated Solvents, GE South Valley, Technical Expert, Natural Resources Damages, Groundwater Contamination, Albuquerque, New Mexico
- Chlorinated Solvents, Technical Consultant for Mediator, Puente Valley, San Gabriel Valley, California
- Chlorinated Solvents in Groundwater, RCRA Site, Cascade Corporation, Portland, Oregon
- CERCLA Site, Halliburton Corporation, Coffeyville, Kansas
- Fate and Transport Study, General Electric Corporation, Albuquerque, New Mexico
- Technical Support, Toxic Tort and Remediation, Tucson International Airport CERCLA Site, Tucson, Arizona
- Lincoln Properties, Insurance Coverage Case, Chlorinated Solvents, Stockton, California
- Landfill Soil and Liner Characterization, IT Corporation, Imperial Valley, California
- Comprehensive Environmental Response Compensation and Liability Act (CERCLA) Litigation Support, Confidential Client, Southern California
- CERCLA Cost Recovery, Confidential Client, Southern California
- Expert Testimony and Technical Support, Confidential Client, CERCLA Site, California
- Chlorinated Solvents in Groundwater, Insurance Coverage Case, Phelps Dunbar, LLP, CERCLA Site, Mountain View, California
- Solvent Storage Tank Site, Insurance Coverage Case, Phelps Dunbar, LLP, San Jose, California
- Landfill Materials Characterization, Casmalia Resources Landfill, Santa Maria, California
- Chlorinated Solvents in Groundwater Contamination, State of New Mexico, Industrial Facility, New Mexico
- Collapsing Soil, City of Albuquerque, Albuquerque, New Mexico

Daniel B. Stephens, Ph.D., P.Hg., R.G.

- Residential Water Source Identification, Property Damage Case, City of Albuquerque, New Mexico
- Organic Solvent Property Damage Case, Albuquerque, New Mexico
- Copper Flats Mine Permit Review, Consultant to New Mexico Energy & Minerals Division, Truth or Consequences, New Mexico
- Beverage Bottling Plant, Environmental Site Assessment, City of Roswell, New Mexico
- Technical Expert for Insurance Coverage Case, Carlsbad, New Mexico
- Mine and Mill Tailings, CERCLA Site Investigation, Cyprus-Amax, Pecos, New Mexico
- Expert Witness for Groundwater and Surface Water Contamination Case, Mine Tailing Pile, LAC Minerals Corporation, Santa Fe, New Mexico
- PCBs and Chlorinated Solvents at Compressor Stations Site Assessment, ENRON Corporation, New Mexico
- PCE-Contaminated Site, Public Service Company of New Mexico, New Mexico
- Hydrogeologic Study, Albuquerque and Alamogordo, New Mexico
- NuMex Landfill Permit Application, Public Hearing, New Mexico Environment Department, Southern New Mexico
- Dense Non-Aqueous Phase Liquid (DNAPL) Migration, F&B Manufacturing Corporation, Phoenix, Arizona
- Nitrate Contamination in Groundwater, Apache Nitrogen, Arizona
- Acid and Metals in Groundwater, Phelps Dodge Corporation, Pinal Creek, Cost Recovery Litigation, Miami, Arizona
- Evaluation of Remedial Action for TCE Contamination, Tucson Airport Authority, Tucson, Arizona
- Dry Cleaner Site, PCE Release, Insurance Coverage Case, Uvalde, Texas
- East Austin Tank Farm, Identification of Petroleum Hydrocarbon Contamination, Travis County District Attorney, Texas
- Chlorinated Solvents, Eagle-Picher Industries, Inc., Property Damage Case, Security, Colorado
- Technical Expert for Insurance Coverage Case, Phelps Dunbar, LLP, Louisiana
- Technical Expert for Contaminant Migration, RCRA Site, Envirosafe Corporation, Boise, Idaho
- Groundwater Modeling Investigation, HydroGeoLogic, Inc., CERCLA Sites, Montana
- Columbia Helicopters, Technical Expert, Insurance Coverage Case, Aurora, Oregon
- Chlorinated Solvents at Rocket Engine Test Sites, Technical Expert, Rockwell International, Contaminated Sites Throughout U.S.
- Wood Treating Facilities, Insurance Coverage Case, International Paper
- Pesticide and Herbicide Migration, Agrochemical Facility, Cost Recovery Action, Santa Fe Rail, California
- RCRA Facility Investigation, Los Alamos National Laboratory, New Mexico

Daniel B. Stephens, Ph.D., P.Hg., R.G.

- Landfill Site Investigation for Environmental Restoration, Los Alamos National Laboratory, New Mexico
- Elicitation Panel Member on Recharge, Yucca Mountain, Nevada
- Peer Review Panelist, Site and Grout Performance Assessments, Westinghouse Hanford Company, Hanford, Washington
- Vadose Zone Roadmap, Chairman of Executive Committee, U.S. Department of Energy/INEEL.
- High Level Nuclear Waste Repository, Hydrogeologic Study, U.S. Nuclear Regulatory Agency, Deaf Smith County, Texas
- Contaminant Transport/Uranium and Vanadium Mill, Colorado Department of Health, Cañon City, Colorado
- Hydrogeologic Evaluation, U.S. Department of Energy, Fernald, Ohio
- Nuclear Power Plant Siting, Groundwater Investigations, San Diego Gas & Electric, Colorado River Region, Arizona and California
- Recharge and Hydrogeologic Analysis, Low-Level Radioactive Waste Disposal Site, El Paso County, Texas

Professional Affiliations

American Chemical Society
American Institute of Hydrology
American Society of Agronomy
American Society for Testing and Materials
American Society for Mining & Reclamation
American Geophysical Union
American Water Resources Association
Arizona Hydrological Society
Association for the Environmental Health of Soils
Crop Science Society of America
Geological Society of America
Ground Water Resources Association of California
International Association of Hydrogeologists
National Ground Water Association
New Mexico Geological Society
Sigma Xi, The Scientific Research Society
Soil Science Society of America

Daniel B. Stephens, Ph.D., P.Hg., R.G.

Professional Experience

Daniel B. Stephens & Associates, Inc., Albuquerque, NM
Chairman of the Board and Principal Hydrologist, 2000 to Present
President, 1984 to 2000

University of New Mexico, Albuquerque, NM
Adjunct Professor of Hydrology, 1990 to Present

New Mexico Institute of Mining and Technology, Socorro, NM
Adjunct Associate Professor of Hydrology, 1989 to Present
Chairman, Geoscience Department, 1984-1987
Associate Professor of Hydrology, 1983-1989
Assistant Professor of Hydrology, 1979-1983

University of Arizona, Tucson, AZ
Instructor of Hydrogeology, 1978

Harshbarger and Associates, Tucson, AZ
Hydrologist, 1976-1978

Fugro, Inc., Long Beach, CA
Hydrologist, 1974-1975

Bechtel, Inc., San Francisco, CA
Geologist, 1973

Gilbert and Associates, Inc., Reading, PA
Geologist, 1972

Advisory Boards

The University of Arizona, Hydrology and Water Resources Department Advisory Committee, Chairman

The University of Arizona, Industrial Advisory Council

New Mexico Tech, Presidential Advisory Committee

Technical Review Boards

Westinghouse Hanford Company, Hanford, Washington: Peer Review Panelist, Site and Grout Performance Assessments

Los Alamos National Laboratory, Los Alamos, New Mexico: Blue Ribbon Panel, Review and Hydrogeologic Data Needs for the Environmental Restoration Program at LANL

Yucca Mountain Project, Department of Energy Expert Elicitation on Recharge

Idaho National Engineering and Environmental Laboratory, Idaho Falls, Idaho: Executive Committee Chairman, National Roadmap for Vadose Zone Science and Technology

Ernest Orlando Lawrence Berkeley Laboratory, Oakland, California: Earth Sciences Division Annual Review Committee

Groundwater Replenishment System, Blue Ribbon Advisory Panel, National Water Research Institute

Daniel B. Stephens, Ph.D., P.Hg., R.G.

Books and Chapters of Books

Stephens, D.B. 1999. Monitoring for Groundwater Management in (Semi-) Arid Regions. Chapter 4, In Vadose Zone Monitoring Strategy to Protect Aquifers from Contamination, UNESCO, Wageningen, The Netherland.

Stephens, D.B. 1996. Vadose Zone Hydrology. CRC Press, Boca Raton, Florida.

Stephens, D.B. 1993. Hydraulic conductivity assessment of unsaturated soils. In D.E. Daniels and S.J. Trautwein (Eds.), Hydraulic Conductivity and Waste Contaminant Transport in Soils, ASTM STP 1142, American Society for Testing and Materials, Philadelphia, Pennsylvania.

Stephens, D.B. 1992. Application of the borehole permeameter. Chapter 4 In Advances in Measurement of Soil Physical Properties: Bringing Theory into Practice. SSSA Special Publication No. 30, Soil Science Society of America, Madison, Wisconsin.

Articles in Professional Journals

Stephens, D.B. and M.A. Ankeny. 2004. A missing link in the historical development of hydrogeology. Ground Water 42(2):304-309.

National Vadose Zone Science and Technology Roadmap Executive Committee, Daniel B. Stephens, Chair. 2002. Letter to the editor on a national strategy for vadose zone science and technology. Vadose Zone Journal 1(1):197-198.

Graves, B.J., D. Jordan, D. Cartron, D.B. Stephens, and M.A. Francis. 2000. Allocating responsibility for groundwater remediation costs. Trial Lawyer, 23(2):159-171.

Stephens, D.B., J.A. Kelsey, M.A. Prieksat, M.G. Piepho, C. Shan, and M.D. Ankeny. 1998. DNAPL migration through a fractured perching layer. Ground Water 26(4):605-610.

Stephens, D.B., K.C. Hsu, M.A. Prieksat, M.D. Ankeny, T.N. Blandford, T.L. Roth, J.A. Kelsey, and J.R. Whitworth. 1998. A comparison of estimated and calculated effective porosity. Hydrogeology Journal 6:156-165.

Stephens, D.B. and C. Shan. 1995. An analytical solution for vertical transport of volatile chemicals in the vadose zone. Journal of Contaminant Hydrology 18:259-277.

Shan, C. and D.B. Stephens, 1995. Steady infiltration into a two-layered soil from a circular source. Water Resources Research, 31(8):1945-1952.

Shan, C. and D.B. Stephens. 1994. Recommendation for usage of SURFER to gridding model results. Ground Water 32(3).

Stephens, D.B. 1994. A perspective on diffuse natural recharge mechanisms in areas of low precipitation. Soil Science Society of America Journal 58(1):40-48.

Stephens, D.B. and L.M. Coons. 1994. Landfill performance assessment at a semi-arid site: Modeling and validation. Ground Water Monitoring and Remediation, Winter 1994.

Shan, C. and D.B. Stephens. 1993. A borehole field method to determine unsaturated hydraulic conductivity. Water Resources Research 29(8):2763-2769.

McCord, J.T., D.B. Stephens, and J.L. Wilson. 1991. Toward validating state-dependent macroscopic anisotropy in unsaturated media: Field experiments and modeling considerations. *In* P.J. Wierenga (Guest Ed.), Validation of flow and transport models for the unsaturated zone. J. Contam. Hydrol. 7:147-177.

Daniel B. Stephens, Ph.D., P.Hg., R.G.

McCord, J.T., D.B. Stephens, and J.L Wilson. 1991. Hysteresis and state-dependent anisotropy in modeling unsaturated hillslope hydrologic processes. Water Resources Research 27(7):1501-1518.

McCord, J.T. and D.B. Stephens. 1988. Comment on "Effective relative permeabilities of anisotropic porous media" by Bear, Braester, and Menier. Transport in Porous Media 3:207-210.

Stephens, D.B., J. Havlena, R.G. Knowlton, Jr., E. Mattson, and W. Cox. 1988. Vadose zone characterization of low-permeable sediments using field permeameters. Ground Water Monitoring Review, Spring.

Stephens, D.B. and S.E. Heermann. 1988. Dependence of anisotropy on saturation in a stratified sand. Water Resources Research 24(5):770-778.McCord, J.T. and D.B. Stephens. 1987. Lateral moisture flow beneath a sandy hillslope without an impending layer. Hydrological Processes Journal 1:225-238.

McCord, J.T. and D.B. Stephens. 1987. Comment on "Effect of ground-water recharge on configuration of the water table beneath sand dunes" by T.C. Winter. J. Hydrology 95:365-367.

Stephens, D.B. 1987. The significance of natural ground-water recharge in site selection for mill tailings disposal. AIME Trans. 280:2064-2068.

Stephens, D.B., K. Lambert, and D. Watson. 1987. Regression models for hydraulic conductivity and field test of the borehole permeameter. Water Resources Research 23(12):2207-2214.

Stephens, D.B. and R. Knowlton, Jr. 1986. Soil water movement and recharge through sand at a semi-arid site in New Mexico. Water Resources Research 22(6):881-889.

Stephens, D.B. and K. Rehfeldt. 1985. Evaluation of closed-form analytical models to calculate unsaturated conductivity in a fine sand. Soil Sci. Soc. Am. J. 49(1):12-19.

Stephens, D.B. 1985. A field method to determine un-saturated hydraulic conductivity using flow nets. Water Resources Research 21(1):45-50.

Stephens, D.B. 1985. Comments on "A reexamination of the constant head well permeameter method for measuring saturated hydraulic conductivity" by W.D. Reynolds, E.D. Elrick, and G.C. Topp. Soil Science 139(2):190.

Hawkins, D.C. and D.B. Stephens. 1983. Ground water modeling in a southwestern alluvial basin. Groundwater 21(6):733-740.

Byers, E. and D.B. Stephens. 1983. Statistical and stochastic analysis of hydraulic conductivity and particle size in a fluvial sand. Soil Sci. Soc. Amer. Proc. 47(6):679-688.

Person, M., R. Antle, and D.B. Stephens. 1983. Evaluation of the surface impoundment assessment in New Mexico. Ground Water 21(6):679-688.

Stephens, D.B. 1983. Groundwater flow and implications for groundwater contamination north of Prewitt, New Mexico, USA. J. Hydrology 61:391-408.

Stephens, D.B. and S.P. Neuman. 1982. Vadose zone permeability tests 1: Review. ASCE J. Hydraulics Division 108 (HY5):623-639.

Stephens, D.B. and S.P. Neuman. 1982. Vadose zone permeability tests 2: Steady state. ASCE J. Hydraulics Division 108 (HY5):640-659.

Stephens, D.B. and S.P. Neuman. 1982. Vadose zone permeability tests 3: Transient case. ASCE J. Hydraulics Division 108 (HY5):660-677.

Stephens, D.B. and S.P. Neuman. 1982. Free surface and saturated-unsaturated analysis of borehole infiltration tests above the water table. Advances in Water Resources 5:111-116.

Daniel B. Stephens, Ph.D., P.Hg., R.G.

Presentations and Articles in Symposia Proceedings

Stephens, D.B. 2005. A Perspective on Science and Research in the Environmental Consulting Industry. Invited presentation at the Annual Fall Meeting of the American Geophysical Union. December 4-9, San Francisco, California.

Stephens, D.B. 2005. Overview of Artificial Recharge Projects: Planning and Implementation Challenges. Invited presentation at the Groundwater Resources Association of California's Artificial Recharge: Nexus of Quantity and Quality in California, March 16-17, Sacramento, California.

Stephens, D.B. and T.Neil Blandford. 2004. Hydrogeologic analysis, transport and modeling for environmental litigation, a case study. Presentation at the National Ground Water Association Ground Water and Environmental Law Conference, May 5-6, 2004, Chicago, Illinois.

Stephens, D.B. 2004. Contaminant Age Dating Using Hydrogeologic Analysis. Invited speaker at the Mealey's Water Contamination Conference, January 26-27, 2004, Pasadena, California.

Stephens, D.B. 2003. Impact of Hydrogeologic Variables on Contaminant Plume Migration and Forensic Modeling. Invited speaker at the International Society of Environmental Forensics Environmental Forensics: Using Science to Reconstruct Contamination Events, December 8-9, 2003, Taipei, Taiwan.

Stephens, D.B. 2003. Late eighteenth century hydrogeology: a pre-Darcy perspective. Presentation at the Geological Society of America Annual Conference, November 2-5, 2003, Seattle, Washington.

Stephens, D.B. 2003. Unexpected field observations and DOE's Vadose Zone Roadmap. Invited speaker at the American Society of Agronomy, Crop Science Society of America, and Soil Science Society of America Annual Meetings, November 2-6, 2003, Denver, Colorado.

Stephens, D.B. 2003. Application of groundwater contaminant transport modeling in environmental forensic investigations: Tucson Airport Superfund Site. Invited speaker at the Workshop on Environmental Forensics: theory, applications and case studies, International Society of Environmental Forensics. May 19-20, 2003, Stresa, Italy.

Stephens, D.B. 2003. Subsurface considerations of artificial recharge. Invited speaker at Artificial recharge in California—technical and policy challenges, Ground Water Resources Association of California. April 30-May 1, 2003. San Jose, California.

Stephens, D.B. 2002. Principles and Case Studies of Allocation of Responsibility for Petroleum Contaminated Soil and Groundwater. Invited speaker at Environmental Forensics: Advanced Techniques, an International Society of Environmental Forensics Workshop, September 23-24, 2002, Santa Fe, New Mexico.

Stephens, D.B. 2002. Principles and Case Studies of Allocation of Responsibility for Petroleum Contaminated Soil and Groundwater. Invited speaker at the Identification and Assessment of Historical Subsurface Contamination: An International Society of Environmental Forensics Workshop, July 1-2, 2002, Milan, Italy.

Stephens, D.B. and W. Cox. 2001. The Importance of the Vadose Zone in Stream-Aquifer Interaction—Field and Model Studies. Presented by Mark Ankeny on behalf of D.B. Stephens at the American Water Resources Association Annual Conference on Water Resources. November 12-15, 2001. Albuquerque, New Mexico.

Stephens, D.B. and T. Neil Blandford. 2001. Hydrogeologic Analysis, Transport and Modeling for Environmental Litigation. A Case Study. Presented by Neil Blandford on behalf of D.B. Stephens at the Arizona Hydrological Society Fourthteenth Annual Symposium. September 12-15, 2001. Tucson, Arizona.

Daniel B. Stephens, Ph.D., P.Hg., R.G.

Stephens, D.B. and T. Neil Blandford. 2001. Hydrogeologic Analysis, Transport and Modeling for Environmental Litigation. A Case Study. Presentation at the First International Congress on Petroleum Contaminated Soils, Sediments, and Water Analysis, Assessment and Remediation, August 14-17, 2001, London, United Kingdom.

Stephens, D.B. 2001. Scientific applications of volume, mass and toxicity for cost allocation modeling. Invited speaker at the University of Wisconsin-Madison, Environmental Litigation: Advanced Forensics and Legal Strategies, April 4-5, 2001, San Francisco, CA.

Stephens, D.B. and S. Kowall. 2000. The DOE Complex-Wide Science and Technology Roadmap: Characterization, Modeling and Simulation of Subsurface Contaminant Fate and Transport. Presentation at the 12th Technical Information Exchange Workshop. November 14-16, 2000. August, Georgia.

Stephens, D.B., K. Hsu, M.A. Prieksat, M.D. Ankeny, T.N. Blandford, T.L. Roth, J.A. Kelsey, and J.R. Whitworth. 2000. Review of Porosity Measurements for Water Supply and Water Quality Modeling. Presented by T. Neil Blandford on behalf of D.B. Stephens at the Southwest Focus Ground Water Conference 2000. May 17-18, 2000. Austin, Texas.

Stephens, D.B. and N.T. Nelson. 2000. Observed natural attenuation of TCA in groundwater. In Proceedings Second International Conference on Remediation of Chlorinated and Recalcitrant Compounds, Monterey, California, May 22-25, 2000. Battelle Press, Columbus, Ohio.

Stephens, D.B. 2000. The role of the unsaturated zone in groundwater recharge. Invited speaker at the Innovations in Artificial Recharge: Augmenting Local Groundwater Supplies for the New Millennium, May 4-5, 2000, Ontario, California.

Stephens, D.B. 2000. Observed natural attenuation of TCA in groundwater. Tenth Annual West Coast Conference on Contaminated Soils and Water, March 20-23, 2000, San Diego, CA.

Stephens, D.B. 2000. MTBE—gasoline additive in the national spotlight. Invited speaker at the Albuquerque Petroleum Association Meeting, February 28, 2000, Albuquerque, NM.

Stephens, D.B. 1999. Physical considerations in artificial recharge. Invited presentation at the 22nd Biennial Ground Water Conference, Interconnected Water Supply in California, September 20-21, San Diego, CA.

Stephens, D.B. 1999. Scientific applications of volume, mass and toxicity for allocating cleanup responsibility. Invited presentation at IBC's Second Annual Executive Forum on Environmental Forensics, June 24-25, 1999, Washington, D.C.

Stephens, D.B. 1999. Basic theory of flow from surface impounds and dry wells used for artificial recharge. Ninth Biennial Symposium on Artificial Recharge of Groundwater, June 10-12, 1999, Tempe, AZ.

Stephens, D.B. 1999. Invited panel member of the Southwest Ground Water—critical issues and information needs, U.S. Geological Survey, Tuscon, Arizona, March 25.

Stephens, D.B. 1998. MTBE fate and transport review. Invited presentation and panel member of the 1998 New Mexico Underground Storage Tank Conference, November 17, 1998, Albuquerque, NM.

Stephens, D.B., W. Cox. 1998. The importance of vadose zone in stream-aquifer interaction: field and model studies. *In* Proceedings Groundwater Protection Council 1998 Annual Forum, Sacramento, California, September 19-23.

Stephens, D.B., E. Seay. 1998. Interpretations of mechanical integrity tests and groundwater monitoring data at a salt water disposal well: a case study. *In* Proceedings Groundwater Protection Council 1998 Annual Forum, Sacramento, California, September 19-23.

Daniel B. Stephens, Ph.D., P.Hg., R.G.

Stephens, D.B. 1998. Scientific applications of volume mass and toxicity for allocating responsibility for aquifer clean-up. Invited presentation at the National Environmental Forensic Conference: Chlorinated Solvent and Petroleum Hydrocarbons, University of Wisconsin-Madison, Department of Engineering Professional Development, Tucson, Arizona, August 27-28.

Stephens, D.B., J.R. Forbes, M.E. Miller, and J. Minier. 1998. PCE degradation near petroleum contaminated sites. *In* Proceedings First International Conference on Remediation of Chlorinated and Recalcitrant Compounds, Monterey, California, May 18-21, 1998. Battelle Press, Columbus, Ohio.

Stephens, D.B. 1998. Principles of vadose zone hydrology. Invited presentation to the City of Tucson Office of Environmental Management, March 6, Tucson, Arizona.

Stephens, D.B. 1997. Case studies in DNAPL delineation, technical infeasibility and remediation cost allocation. Invited keynote speaker at the International Conference on Remedial Technology and Management of Subsurface Contamination, December 1-3, Taipei, Taiwan.

Stephens, D.B., J.A. Kelsey, M.A. Prieksat, M.G. Piepho, C. Shan, and M.D. Ankeny. 1998. DNAPL migration through a fractured perching layer. Presentation at the Geological Society of America Annual Meeting, October 21, Salt Lake City, Utah.

Stephens, D.B. 1997. Principles of vadose zone hydrology. Invited presentation of a two-day short course presented to the New Mexico Environment Department Underground Storage Tank Bureau, October 15-16, Santa Fe, New Mexico.

Stephens, D.B. 1997. Infiltration modeling roles in RBCA. Invited presentation and panel member of the 1997 New Mexico Underground Storage Tank Conference, September 9-10, Ruidoso, New Mexico.

Stephens, D.B., T.N. Blandford, A. Lewis. 1997. Hydrogeology short course. Invited presentation to the State of New Mexico, Environment Department, Drinking Water Bureau, April 9, Santa Fe, New Mexico.

Stephens, D.B. 1996. Borehole permeameter development, applications and limitations. Presentation at American Geophysical Union Fall Meeting, December 15-19, San Francisco, California.

Stephens, D.B. 1996. Hydrogeology and contaminant transport. Invited presentation at The Who, What, Where & How of Toxic Tort Litigation, The Arizona Bar Association Continuing Legal Education, November 22, Phoenix, Arizona.

Stephens, D.B., J.A. Kelsey, M.A. Prieksat, M.G. Piepho, M.D. Ankeny, and C. Shan. 1996. DNAPL migration in a complex multi-aquifer system. Presentation at Geological Society of America Annual Meeting, October 28-31, Denver, Colorado.

Stephens, D.B., J.A. Kelsey, M.A. Prieksat, M.G. Piepho, M.D. Ankeny, and C. Shan. 1996. DNAPL migration in a complex multi-aquifer system. Presentation at HSRC/WERC Joint Conference on the Environment, May 21-23, Albuquerque, New Mexico.

Stephens, D.B. 1996. Estimating cleanup costs for purposes of mediation: Achieving finality in face of uncertainty. Invited presentation at Resolving Environmental Disputes Through Mediation conference, University of Wisconsin, May 16-17, Albuquerque, New Mexico.

Stephens, D.B. 1996. Principles of vadose zone hydrology. Invited presentation of a two-day short course presented to Westinghouse Savannah River Company, March 27-28, Aiken, South Carolina.

Stephens, D.B., J. Minier, and M.E. Miller. 1996. Subsurface migration and transformation of PCE. Presentation at the New Mexico Conference on the Environment, March 12-14, Albuquerque, New Mexico.

Daniel B. Stephens, Ph.D., P.Hg., R.G.

Forbes, J.R. and D.B. Stephens. 1996. Natural biodegradation of subsurface hydrocarbons: Case studies from the southwest United States. Presentation at Bioremediation Technology Transfer Conference, EPA Western Region Hazardous Subresearch Center and Albuquerque Technical Vocational Institute, February 16, Albuquerque, New Mexico.

Stephens, D.B. 1995. Vadose zone processes, characterization and monitoring. Invited workshop at the National Ground Water Association Outdoor Action Conference, May 2-3, Las Vegas, Nevada.

Stephens, D.B. 1995. Site characterization, remediation: Better/cheaper/faster. Invited presentation at Los Alamos Environmental Restoration Technical Session, Los Alamos National Laboratory, April 19, Los Alamos, New Mexico.

Stephens, D.B. 1995. Environmental remediation technology. Invited presentation at New Mexico Water Law Water Rights and Water Quality Issues, August 28-29, Santa Fe, New Mexico.

Stephens, D.B., M.A. Ankeny, J.F. Forbes, and J.A. Havlena. 1995. Vadose zone hydrology: Processes, characterization and monitoring. Short course presented in conjunction with Environmental Education Enterprises, Inc., October 18-20, Albuquerque, New Mexico.

Stephens, D.B. 1994. The role of consultants in water rights matters. Presented at Cambridge Institute seminar on New Mexico Water Rights: Key Issues and Recent Developments, March 16, Santa Fe, New Mexico.

Stephens, D.B. 1994. The significance of saturated hydraulic conductivity and residual water content in predictions of unsaturated transport. Invited presentation at the Soil Physics Workshop on Subsurface Transport at Battelle, March 31-April 1, Richland, Washington.

Stephens, D.B. 1994. Basic concepts in vadose zone hydrology. Workshop at the National Ground Water Association Outdoor Action Conference, May 23-24, Minneapolis, Minnesota.

Stephens, D.B. and R.S. Bowman. 1994. Principles of vadose zone hydrology. Short course for the National Ground Water Association, June 20-21, San Antonio, Texas.

Stephens, D.B. 1994. Vadose zone course short course. Ohio University, June 23, Athens, Ohio.

Stephens, D.B. 1994. Principles of vadose zone hydrology. Invited presentation to Bechtel Corporation, November 1-2, San Francisco, California.

Stephens, D.B. and T.N. Blandford. 1994. Hydrogeology short course. Invited presentation to the State of New Mexico, Environment Department, Drinking Water Bureau, December 6-7, Santa Fe, New Mexico.

Stephens, D.B. 1993. Vadose zone characterization of hydraulic properties. Invited presentation at the DOE workshop on Characterization of Glacial Tills, April 15-16, Cincinnati, Ohio.

Stephens, D.B. 1993. Vadose zone processes, characterization, and monitoring. Invited presentation at the National Ground Water Association Outdoor Action Conference, Outdoor Workshops, May 25-27, Las Vegas, Nevada.

Stephens, D.B. 1993. Unsaturated flow and recharge. Invited presentation at the 19th Annual Field Studies in Groundwater Contamination Evaluation in Three Modules, Ohio University, June 25, Athens, Ohio.

Stephens, D.B. and J.C. Stageman. 1993. The consultant's role in addressing environmental risks in real estate and lending. Invited presentation at the Cambridge Institute workshop on Tackling Environmental Issues in New Mexico, September 24, Albuquerque, New Mexico.

Stephens, D.B. 1993. Designing a vadose zone monitoring system for municipal and hazardous waste landfills. 16th Annual Rocky Mountain Groundwater Conference, September 13-16, Albuquerque, New Mexico.

Daniel B. Stephens, Ph.D., P.Hg., R.G.

Stephens, D.B. 1992. A comparison of the calculated and measured unsaturated hydraulic conductivity of two uniform soils in New Mexico. *In* M.Th. van Genuchten, F.J. Leij, and L.J. Lund (eds.), Proc. International Workshop on Indirect Methods for Estimating the Hydraulic Properties of Unsaturated Soils, October 11-13, 1989, Riverside, California. University of California, Riverside, California.

Stephens, D.B. 1992. A hydrogeologist's encounter with geologic problems in New Mexico. Guest lecture at the New Mexico Geological Society Annual Spring Meeting, April 10, Socorro, New Mexico.

Stephens, D.B. 1992. Vadose zone processes, characterization, and monitoring. Invited presentation at the National Ground Water Association Outdoor Action Conference, Indoor Workshops, May 11-13, Las Vegas, Nevada.

Stephens, D.B. 1992. Unsaturated flow and recharge. Invited presentation at the 18th Annual Field Studies in Groundwater Contamination Evaluation in Three Modules, Ohio University, June 15-July 3, Athens, Ohio.

Stephens, D.B. 1992. Encounters with geologic problems in New Mexico. Guest lecture at the AWWA-WPCA (WEA) meeting, July 28, Albuquerque, New Mexico.

Stephens, D.B. 1992. Characterizing the leaching potential of landfills. Invited presentation at the American Geophysical Union Western Pacific Geophysics Meeting, August 17-21, Hong Kong, China.

Stephens, D.B. 1992. Cost-effective remediation at UST sites. Presentation at the Cost-Effective Corrective Action session during the New Mexico Conference on the Environment, September 15, Albuquerque, New Mexico.

Stephens, D.B. 1992. Observation of the effects of heterogeneity on unsaturated flow. Invited presentation at the Remson Symposium, 1992 American Geophysical Union Fall Meeting, December 7-11, San Francisco, California.

Bowman, R.S., D.B. Jaynes, R.C. Rice, and D.B. Stephens. 1991. Field determination of solute transport parameters in "homogeneous" vs. "heterogeneous" soils. Presented at the ASA-CSSA-SSSA 83rd Annual Meeting, October 27-November 1, Denver, Colorado.

Havlena, J. and D.B. Stephens. 1991. Vadose zone characterization using field permeameters and instrumentation. *In* Proc. Symp. Ground Water and Vadose Zone Investigation, ASTM, January 30-February 1, San Diego, California.

Havlena, J.A. and D.B. Stephens. 1991. Vadose zone characterization using field permeameters and instrumentation. *In* D.M. Nielsen and M.N. Sara (ed.), Current practice in ground water and vadose zone instrumentation, ASTM STP 118, American Society for Testing Materials, Philadelphia.

Stephens, D.B. 1991. Diffuse, natural recharge calculated from field data and comparisons among semiarid sites. Presented at the ASA-CSSA-SSSA 83rd Annual Meeting, October 27-November 1, Denver, Colorado.

Stephens, D.B. 1991. Characterizing permeability to gas in the vadose zone. Invited presentation at the Symposium on Soil Venting, sponsored by the Robert S. Kerr, Environmental Research Laboratory and the National Center for Ground Water Research, April 29-May 1, Houston, Texas.

Stephens, D.B. 1991. Vadose zone characterization and monitoring. Invited presentation for the Hazardous/Radioactive Waste Management Videoconference Training Series, Program 5: Site Characterization, June 12, University of New Mexico, Albuquerque, New Mexico.

Stephens, D.B. 1991. Unsaturated flow and recharge. Invited presentation at the 17th Annual Field Studies in Water Resource and Contamination Evaluation, Ohio University, June 10-28, Athens, Ohio.

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Stephens, D.B., R.S. Bowman, E. Mattson, A. Parsons, K. Flannigan, R. Schmidt-Petersen, D. Grabka, P. Arnet, and A. Stark. 1991. Long-term three-dimensional infiltration, drainage, and transport in a heterogeneous soil. Presented at the 1991 AGU Fall Meeting, December 9-13, San Francisco, California.

Stephens, D.B. 1990. Uncertainties in site characterization data. Invited paper, 12th Annual U.S. DOE Low-Level Waste Management Conference, August 28, Chicago, Illinois.

Beach, J.A., D.B. Stephens, and A.L. Gutjahr. 1989. Incorporation of spatial variability in mill tailings hydraulic properties into numerical models: Implications for uncertainty in seepage prediction and ground water protection. Ninth Annual AGU Front Range Branch Hydrology Days, April 17-21.

Bowman, R.S., D.B. Stephens, D.P. Grabka, K.G. Flanigan, and Department of Geoscience, New Mexico Institute of Mining and Technology. 1989. A multi-tracer field experiment to evaluate solute transport in variably saturated soils. Tracers in Hydrogeology: Principles, Problems, and Practical Applications, National Water Well Association Conference, October 31-November 1, Houston, Texas.

Parsons, A.M., E.D. Mattson, D.B. Stephens, K. Flanigan, and K. Black. 1988. Field simulation of waste impoundment seepage in the vadose zone. In Proc. FOCUS on Southwestern Groundwater Issues Conference, National Water Well Association, March 23-25, Albuquerque, New Mexico.

Cox, W.B. and D.B. Stephens. 1988. Field study of ephemeral stream-aquifer interaction. *In* Proc. FOCUS on Southwestern Groundwater Issues Conference, National Water Well Association, March 23-25, Albuquerque, New Mexico.

McCord J.T., D.B. Stephens, and J.L. Wilson. 1988a. Field experiments and numerical simulations of unsaturated flow and transport: Role of hysteresis and state-dependent anisotropy. NATO Advanced Study Institute on Recent Advances in Modeling Hydrologic Systems, July 1988, Sintra, Portugal.

McCord J.T., D.B. Stephens, and J.L. Wilson. 1988b. Field-scale unsaturated flow and transport in a sloping, uniform porous media: Field experiments and numerical simulation (Abs). International Conference and Workshop on Validation of Flow and Transport Models for the Unsaturated Zone, Poster Session, May 22-25, Ruidoso, New Mexico.

Stephens, D.B., A.M. Parsons, E.D. Mattson, K. Black, K. Flanigan, R.S. Bowman, and W.B. Cox. 1988. A field experiment of three-dimensional flow and transport in a stratified soil. p. 401-413. *In* P.J. Wierenga and D. Bachelet (eds.), Proc. International Conference and Workshop on Validation of Flow and Transport Models for the Unsaturated Zone, May 22-25, Ruidoso, New Mexico. New Mexico State University, Las Cruces.

Stephens, D.B., J.T. McCord, R.G. Knowlton, Jr., B. Kickham, E. Hicks, and T. Stein. 1988. Three-dimensional soil-water flow in semi-arid terrain (Abs). International Conference on Advances in Ground-Water Hydrology, November 16-18, Tampa, Florida.

McCord, J.T. and D.B. Stephens. 1987. Infiltration and recharge on a sandy hillslope in an arid climate. International Conference on Infiltration Development and Application, University of Hawaii, January 6-9. Manoa, Hawaii.

Stephens, D.B. 1987. Processes affecting the movement and fate of pesticides in soil and groundwater. New Mexico Environmental Improvement Division, May 27, Santa Fe, New Mexico.

Stephens, D.B. 1986. Saturated-unsaturated flow relationships. 15th Annual Rocky Mountain Groundwater Conference, September 13-16, Phoenix, Arizona.

Larson, M.B. and D.B. Stephens. 1985. A comparison of methods to characterize unsaturated hydraulic properties of mill tailings. *In* Proceedings Seventh Symposium on Management of Uranium Mill Tailings, Low-level Waste and Hazardous Waste, Colorado State University, February 6-8, Ft. Collins, Colorado.

Daniel B. Stephens, Ph.D., P.Hg., R.G.

Lewis, B. and D.B. Stephens. 1985. Analysis of infiltration through mill tailings using a bromide tracer. *In* Proc. Seventh Symp. on Management of Uranium Mill Tailings, Low-Level Waste and Hazardous Waste, Colorado State University, February 6-8, Ft. Collins, Colorado.

Stephens, D.B., R.G. Knowlton, Jr., M. Stanfill, and E.M. Hirtz. 1985. Field study to quantify seepage from a fluid impoundment. pp. 283-308. *In* Proc. NWWA Conf. on Characterization and Monitoring of the Vadose (Unsaturated) Zone, November 19-21, Denver, Colorado. NWWA, Dublin, OH.

Stephens, D.B. 1984. Groundwater flow and implications for groundwater contamination in sedimentary formations of the southern San Juan Basin, New Mexico, USA. International Groundwater Symposium on Groundwater Resources Utilization and Contaminant Hydrology, Canada Water Well Association, May 21-23, Montreal, Canada.

Stephens, D.B., K. Lambert, and D. Watson. 1983. Influence of entrapped air on field determinations of hydraulic properties in the vadose zone. *In* Proc. Conf. on Vadose Zone Characterization and Monitoring, December 8-10, Las Vegas, Nevada. National Water Well Association, Columbus, Ohio.

Stephens, D.B., S. Tyler, K. Lambert, and S. Yates. 1983. Field experiments to determine saturated hydraulic conductivity in the vadose zone. pp. 113-126. *In* J.W. Mercer et al. (ed.), Role of the unsaturated zone in radioactive and hazardous waste disposal. Ann Arbor Sci, Ann Arbor, Michigan.

Stephens, D.B. and J. Siegel. 1981. Fluid waste movement through the vadose zone. pp. 103-110. In S.G. Wells and W. Lambert (ed.) Environmental Geology and Hydrology in New Mexico. New Mexico Geological Society, Special Pub. 10.

Siegel, J. and D.B. Stephens. 1980. Numerical simulation of seepage beneath lined ponds. pp. 219-232. *In* Proc. Symposium on Uranium Mill Tailings Management, November 24-25, Ft. Collins, Colorado.

Stephens, D.B. and S.P. Neuman. 1980. Free surface and saturated-unsaturated analyses of borehole infiltration tests above the water table. pp. 2.229-2.238. *In* Third International Conference on Finite Elements in Water Resources, May 19-23, Oxford, Mississippi, USDA-ARS.

Other Publications

Stephens, D.B., P. Johnson, and J. Havlena. 1996. Estimation of infiltration and recharge for environmental site assessment. American Petroleum Institute publication number 4643.

Bowman, R.S., D.B. Stephens, P. Arnet, D.P. Grabka, R.I. Schmidt-Petersen, and A.M. Stark. 1991. Field study of multidimensional flow and transport in the vadose zone. Report No. 262, New Mexico Water Resources Research Institute, December 1991.

Stephens, D.B. and C. Spaulding. 1984. Oil-field brine contamination: A case study, Lea County, New Mexico. In W.J. Stone, Selected papers on water quality and pollution in New Mexico, Bureau of Mines and Mineral Resources, Hydrologic Report 7.