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



**IN THE MATTER OF THE APPLICATION OF THE NEW MEXICO OIL AND GAS ASSOCIATION FOR AMENDMENT OF CERTAIN PROVISIONS OF TITLE 19, CHAPTER 15 OF THE NEW MEXICO ADMINISTRATIVE CODE CONCERNING PITS, BELOW GRADE TANKS, CLOSED LOOP SYSTEMS AND OTHER ALTERNATIVE METHODS TO THE FOREGOING, AND AMENDING OTHER RULES TO CONFORMING CHANGES STATEWIDE.**

**CASE NO. 14784**
**CASE NO. 14785**

**NOTICE OF INTENT TO PRESENT TECHNICAL AND NON-TECHNICAL TESTIMONY**

Pursuant to 19.15.3.11 and the New Mexico Oil Conservation Commission's ("Commission") December 3, 2012 public notice, Earthworks' Oil & Gas Accountability Project ("OGAP") hereby gives notice that it intends to present technical and non-technical testimony and conduct cross-examination at the hearing scheduled to begin on January 9, 2013 on the proposed waste table amendments related to closure requirements in the amendments of the rule governing regulation of pits, below grade tanks, closed loop waste systems and alternatives to those waste disposal methods ("Pit Rule").



OGAP is a non-profit organization that works with urban, rural and Native communities to protect their homes, health, and environment from the impacts of oil and gas development. OGAP is a resource for these communities, providing expertise on oil and gas development, environmental impacts and public health impacts. OGAP has thousands of members nationwide and 400 members in New Mexico. OGAP and its members have an interest in the revisions to the Pit Rule because they will impact how oil and gas companies conduct their operations in and near members' communities.

Moreover, OGAP was a party to the hearing adopting the current Pit Rule at 19.15.17 *et. seq.* NMAC and to the hearing amending the Pit Rule's chloride standard.

OGAP has serious concerns with the New Mexico Oil and Gas Association's ("NMOGA") and the Independent Petroleum Association of New Mexico's ("IPANM") proposed revisions to the concentrations of waste permitted for onsite burial in their entirety. The proposed waste concentrations pose significant safety risks to the public health and the environment. Specifically, the proposed waste concentrations pose significant risks of contamination to fresh water sources and potential drinking water sources. Consequently, OGAP is opposed to the proposed changes in waste concentrations for closure and reclamation.

OGAP intends to present two technical witnesses: Dr. Glenn Miller and Dr. Tom Myers. A summary of their testimony is provided in Section III. Dr. Miller's curriculum vitae is attached as Exhibit A. Dr. Myers's curriculum vitae is attached as Exhibit B. In addition, OGAP reserves the right to call Dr. Miller, Dr. Myers and any other witnesses as rebuttal witnesses if that is appropriate. OGAP may also provide non-technical testimony and conduct cross-examination.

**I. Party presenting technical testimony:** Earthworks' Oil & Gas Accountability Project.

**II. Name and Qualifications of witnesses to be presented:**

A. Dr. Glenn Miller: Dr. Miller holds a Ph.D. in Agricultural and Environmental Chemistry from the University of California at Davis. Dr. Miller has extensive experience in the field of chemical exposure, both from the academic and regulatory perspective. Dr. Miller worked as a research chemist for the U.S.

Environmental Protection Agency. He currently teaches in the environmental sciences programs at the University of Nevada, Reno, and is Director of the graduate program in Environmental Sciences. The courses he teaches include Environmental Toxicology; Environmental Chemicals: Exposure, Transport and Fate; Risk Assessment; and Environmental Analytical Chemistry. Dr. Miller has also published peer-reviewed articles on hydrocarbon waste remediation.

B. Dr. Tom Myers: Dr. Myers holds a Ph.D. in Hydrology and Hydrogeology from the University of Nevada, Reno. Dr. Myers has expertise in the areas of contaminant transport and fate. Dr. Myers has prepared numerous reports on contaminant fate and transport for conservation organizations and government regulatory agencies. These reports have included analyses of the transport and fate of wastes related to oil and gas operations, including hydraulic fracturing. Dr. Myers has also published articles in peer reviewed publications concerning the transport of contaminants as associated with oil and gas operations, waste from mining facilities, and seepage through lined waste facilities. Finally, Dr. Myers has extensive experience with various contaminant transport models.

C. OGAP reserves the right to call any witness necessary to authenticate any exhibit to be introduced at the hearing, any witness listed or called by any other party in this matter, and any witnesses necessary for rebuttal or impeachment. Additionally, OGAP reserves the right to introduce necessary exhibits for rebuttal or impeachment.

**III. Summary of Testimony:**

A. Dr. Miller's testimony will include, but will not necessarily be limited to, the following:

Dr. Miller will review the testimony and other evidence already proffered in this proceeding and in the 2007 Pit Rule proceeding and draw upon his experience, peer-reviewed literature, and published data to demonstrate that the proposed waste concentrations in NMOGA's and IPANM's petitions pose a risk to public health and the environment. Dr. Miller will explain the adverse health effects of the wastes commonly associated with oil and gas exploration and development, including those wastes for which concentrations are provided on NMOGA's and IPANM's proposed waste tables. Dr. Miller will then evaluate the waste concentrations NMOGA and IPANM propose and determine the risks to public health and the environment if waste is allowed to be buried on-site in those concentrations. Dr. Miller will conclude by testifying that the waste concentrations in the current Pit Rule are more appropriate to protect public health and the environment.

**Duration of Testimony:** Approximately four hours, not including cross-examination.

**Recommended Changes to the Proposal:** Dr. Miller will testify in opposition to the proposed changes to the concentrations of waste allowed for on-site burial in the Pit Rule.

B. Dr. Myers' testimony will include, but will not necessarily be limited to, the following:

Dr. Myers will review the testimony and other evidence already proffered in this proceeding and in the 2007 Pit Rule proceeding and draw upon his experience, peer-reviewed literature, and published data to demonstrate that the proposed waste concentrations in NMOGA's and IPANM's petitions pose a risk to public health and the environment. Dr. Myers' testimony will demonstrate that with conservative assumptions, waste buried in a pit or trench in the concentrations under the proposed waste tables will

likely reach groundwater in concentrations that pose a risk to human health in a relatively short timeframe that could be measured in years or decades.

**Duration of Testimony:** Approximately four hours, not including cross-examination.

**Recommended Changes to the Proposal:** Dr. Myers will testify in opposition to the proposed changes to the concentrations of waste allowed for on-site burial in the Pit Rule.

C. OGAP reserves the right to call any witness necessary to authenticate any exhibit to be introduced at the hearing, any witness listed or called by any other party in this matter, and any witnesses necessary for rebuttal or impeachment. A summary of that testimony cannot be provided because the necessity of rebuttal, impeachment or authenticating witnesses cannot be anticipated and the substance of such witnesses' testimony likewise cannot be anticipated.

Dated: January 2, 2013

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## CERTIFICATE OF SERVICE

I hereby certify that on this 2nd day of January, 2013, I have delivered a copy of the foregoing pleading in the above-captioned case via electronic mail and/or US Mail, First Class to the following:

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By:

# CURRICULUM VITAE

MILLER, GLENN C.

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Born November 17, 1950

Education:

| | | |
|---|---|---|
| University of California, Santa Barbara, CA | B.S. Chemistry | 1972 |
| University of California, Davis, CA | Ph.D. Agricultural Chemistry | 1977 |

Employment:

| | | |
|---|---|---|
| Univ. of Nevada, Reno | Aug-2009-present | Professor, and Director of the Graduate Program in Environmental Sciences |
| | 2008-2009 | On leave for 11 months serving as Manager, Environmental Exposure Assessment, Valent USA Corporation, Walnut Creek CA |
| | 2007-2008, 2010-present | President UNR Nevada Faculty Alliance |
| | 1995-2006 | Director, Graduate Program in Environmental Sciences and Health |
| | 1998-2004 | Director, Center for Environmental Science and Engineering |
| | 1989- | Professor |
| | 1983-89 | Associate Professor |
| | 1979-83 | Assistant Professor |
| | 1978-79 | Lecturer |
| Environmental Protection Agency | 1977-78 | Research Chemist |

Professional Societies:

American Chemical Society, Agrochemicals Division and Environmental Division
American Association for the Advancement of Science
Society of Environmental Toxicology and Chemistry
Sigma Xi

Awards:

Thornton Peace Prize (1982)
Junior Faculty Research Award (1982)
UNR Foundation Professor (1991)
Conservationist of the Year, Nevada Wildlife Federation (1995)
College of Agriculture Researcher of the Year (1998)
Friend of the Lake Award, League to Save Lake Tahoe (2001)



Exhibit A

Other Professional Activities

Environmental Protection Agency: Competitive Grants Review Panel 1985-1995
Environmental Protection Agency: Advisory Committee on Mining Waste 1991-1993
Environmental Protection Agency: Stakeholder Advisory Committee on Commodity Mercury 2007
Nevada Division of Environmental Protection: Technical Advisory Committee on the Carson River Superfund Site 1991-1994
American Chemical Society, Division of Environmental Chemistry: Chair of the Student Awards Committee 1988-1992
American Chemical Society, Division of Environmental Chemistry: Chair of the Awards Committee 1997-2002
UNR Environmental Studies Board: Chairman 1987-1991
UNR Environmental Science and Health Graduate Program: Director 1995-2006
Consultant to various public interest organizations, companies and law firms
Hydrology/Hydrogeology Graduate Faculty: Member 1989-present
Reviewer for numerous environmental chemistry journals
Co-owner and vice-president: Nevada Environmental Laboratories (Las Vegas and Reno) 1990-1999
Manager, Environmental Exposure Assessment, Valent USA Corporation 8/2008- 8/2009

Courses Taught

Humans and the Environment: Environment 100
Environmental Toxicology: NRES 432/632
Environmental Chemicals: Exposure, Transport and Fate: NRES 433/633
Analysis of Environmental Contaminants: NRES 430/630
Risk Assessment, NRES 793C
Global and Regional Issues in Environmental Science: NRES 467/667

Community and Conservation Service Activities

City of Reno, Charter Review Commission: Chairman 1990-93
Peavine Grade School PTA: Co-President 1990-1992
Sierra Club Mining Committee (national): Co-Chair 1989-1992
League to Save Lake Tahoe Board of Directors: 1986-1999
Mountain and Desert Research Fund: 1987-present
Dupont-Conoco Environmental Leadership Award in Mining Committee: 1989-1994
Nevada Interagency Reclamation Award Committee: 1990-1992
Washoe County School District Science Advisory Board: 1992-2000
Chairman, 1993-94
Earthworks: Board Member 1999-present
Tahoe Baikal Institute: Board Member 1998-present, Chair 2002-2003
Environmental Law Alliance Worldwide Board Member: 2000-present, Chair:2009
Great Basin Mine Watch: Board Member 1994-present, Chair 2001-2006
Center for Science in Public Participation: Board Member 1998-present
Great Basin Institute, Board Member 2000-present, Chair 2001-present
United Nations Environmental Program Committee for Development of a Code for Use of Cyanide in Mining: 2000-2002
Mining, Minerals and Sustainable Development, Assurance Group Committee Member, 2000-2002
National Research Council committee on Methyl Bromide: 1999-2001
National Research Council committee on Mining Technology: 2000-2002

National Research Council committee on USGS Mineral Resources Program, 2000-2003
US Environmental Protection Agency Committee on Management of Mercury Stores in the U.S. 2007

Research Interests: Remediation of mine waste contamination. Mining pit lake water quality. Fate and transport of organic compounds in soils and the atmosphere. Methods of remediation of gasoline contaminated soils; Photochemical transformation of organic contaminants on soil surfaces. Instrumental development of chromatographic systems. Development of arid lands biofuels

Grants Received: (1982-present)

$ 14,550 "Atmospheric Photolysis of Pesticides," A Junior Faculty Research Award from the UNR Research Advisory Board, 1982.

$ 3,000 "Photolysis of CGA-41065," CIBA GEIGY Corporation, 1982.

$ 4,000 "Chemotaxonomy of Sagebrush Using High Performance Liquid Chromatography," Intermountain Research Station USDA, 1984.

$ 83,000 "Analysis of Bovine Tissue for Chlorinated Hydrocarbons," Environmental Protection Agency, 1984-85.

$ 18,300 "Photooxidation of Sulfide Containing Pesticides on Soil Surfaces," Western Regional Pesticide Impact Assessment Program, 1984.

$ 2,500 "Identification of Sagebrush Taxa Based on Liquid Chromatographic Analyses of Phenolics" Research Advisory Board, 1986.

$235,500 "Factors Affecting the Photolysis of Dioxins on Soil Surfaces," U.S. Environmental Protection Agency, 1986-89.

$ 15,160 "Vapor Phase Photolysis of Phorate," American Cyanamid Corporation, 1987.

$ 2,500 "Identification of Sagebrush Taxa Based on Liquid Chromatographic Analyses of Phenolics," UNR Research Advisory Board, 1987.

$ 48,792 "Upgrading Municipal Wastewater Effluents for Urban Water Reuse through Phytochemical Oxidations: System Development and Operational Criteria," U.S. Geological Survey, State Water Research Institute Program (Co-P.I. with Richard Watts), 1986-88.

$ 17,200 "Vapor Phase Photolysis of Malathion," American Cyanamid, 1988.

$ 16,460 "Aging Groundwater: A comparison of the Fluorocarbon Method to the Tritium Method," U.S. Geological Survey, State Water Research Institute Program (Co-P.I. with K. Sertic), 1988-89. (Competitive Grant, State of Nevada) Terminated 6-89.

$206,000 "In Situ Treatment of Organic Hazardous Wastes in Surface Soils Using Fenton's Reagent." U.S. Environmental Protection Agency (Co-P.I. with Richard Watts), 1988-89. (Competitive Grant, national)

$ 23,200 "Evaporation of Gasoline from Soils," Nevada Division of Environmental Protection Co-P.I. with Susan Donaldson), (Contract).

$ 50,000 "Photolysis of Pesticides on Soils," American Cyanamid Corporation (Unrestricted Grant, noncompetitive)

$ 15,600 "Vapor Phase Photolysis of Diazinon and Methyl Parathion" Western Region Pesticide Impact Assessment Program (USDA) (competitive) 1989-90

$ 30,000 "Interface for a Capillary electrophoresis Effluent and a Mass Spectrometer" Linear Corporation 1989-90. (Co P.I. with Murray Hackett) (contract)

$ 15,000 "UV-Gas Chromatographic Dectector" Linear Corporation 1990. (Co P.I. with Murray Hackett) (Noncompetitive grant)

$153,000 "Enhancement of Photodegradation of Pesticides in Soil by Transport Upward in Evaporating Water" (USGS Competitive) 1991-94

$ 50,000 "Pit Water from Precious Metal Mines" U.S. Environmental Protection Agency, 1992-94

$ 91,000 "Remediation of Acid Mine Drainage at Leviathon Mine" Lahontan Water Quality Control Board. (Contract, Co P.I. with Tom Wildman, Colorado School of Mines) 1992-94.

$159,000 " Ecological Toxicology of Metam Sodium and it Derivatives in the Terrestrial and Riparian Environments of the Sacramento River" California Fish and Game, 1992-1995 (G.C. Miller project, part of a larger project with George Taylor at the Desert Research Institute)

$43,092 "Atmospheric Transport and Deposition of Organophosphates and Other Pesticides as Input to Sierra Nevada Surface Waters" USDA-NRI. 1995-98. Co-P.I. with P.I. James N. Seiber. Task 2.

$80,427 "Linked Techniques for Contaminant Removal from Soil in Arid/Semiarid Environments" Dept. of Energy. 1993-96. Co.P.I with James N. Seiber.

$107,000 "Chemical Environmental Problems Associated with Mining" NIEHS 1993-96. Core B portion. This was a project of a larger Superfund Grant to UNR. James N. Seiber, P.I.

$36,900 "Protocol for Evaluation of Pesticide Photodegradation" Dow-Elanco. 1995-97. (Contract)

$45,000 "Photolysis of Pesticides" Dupont Chemical Company. 1995-98. Unrestricted gift to support ongoing research.

$275,000 "Remediation of Acid Mine Drainage at the Leviathan Mine". Nevada Division of Environmental Protection. 1996-99

$5000 "Evaluation of Limnology and Water Quality of a Porphyry-Copper Pit Mine Lake" Public Resource Associates 1996.

$767,000 Geochemical, Biological and Economic Impacts of Arsenic and Related Oxyanions on a Mining-Impacted Watershed". NSF-EPA, 1997-01

$46,000 "Remediation of Acid Mine Drainage at the Leviathan Mine". Lahontan Regional Water Quality Control Board, 2000-2001

$30,000 "Use of Sulfate-Reducing Bioreactors to Remove Zinc in Mine Drainage" Placer Dome Corporation. 2000-2001

$50,000 "Release of Gasoline Constituents from Marine Engines to Lake Tahoe" Lahontan Regional Water Quality Control Board, 1998-1999

$70,000 "Impact of Marine Engine Exhaust on Pyramid Lake" U.S. Environmental Protection Agency, in cooperation with the Pyramid Lake Paiute Tribe. 2000-2001.

$570,000 "An Environmental Assessment of the Impacts of Polycyclic Aromatic Hydrocarbons in Lake Tahoe and Donner Lake" California Regional Water Quality Control Board, Lahontan Region. 2001-2003.

$126,000 "Operation of a Bioreactor at the Leviathan Mine" Contract with ARCO, 2001-2002

$75,000 Trifluroacetic Acid in Antarctic Ice, National Science Foundation 2001-2004

$190,500 "Mercury Deposition Associated with Mining, U.S. Environmental Protection Agency, 2002-2004

$53,000 Passivation of Acid Generating Rock at the Golden Sunlight Mine, Placer Dome Corporation 2002-2003

$520,000 "Operation of a Bioreactor at the Leviathan Mine" Contract with ARCO, 2003-2007

$250,000 "Risk Assessment and Fate of Polyacrylamide and Acrylamide in Irrigation Canals and Receiving Water" A subcontract from the Desert Research Institute on a project from the U.S. Bureau of Reclamation. 2004-2008

$55,000 Passivation of Acid Generating Rock, Freeport McMoran, 2009-2010

$75,000 Biofuel crops on arid lands, Co-P.I. U.S. Department of Energy, 2010-2011

Publications:

G.C. Miller and D.G. Crosby, "Photodecomposition of Sustar$^{R}$ in Water." J. Agric. Food Chem. 26:1316 (1978).

G.C. Miller and R.G. Zepp, "Effects of Suspended Sediments on Photolysis Rates of Dissolved Pollutants." Water Research 13:453 (1979).

G.C., Miller, M.J. Miille, D.G. Crosby, S. Sontum and R.G. Zepp, "Photosolvolysis of 3,4-Dichloroaniline in Water: Evidence for an Aryl Cation Intermediate." Tetrahedron 35:1797 (1979).

G.C. Miller and R.G. Zepp, "Photoreactivity of Pollutants Sorbed on Suspended Sediment." Environ. Sci. Technol. 13:860 (1979).

G.C. Miller, R. Zisook and R.G. Zepp, "Photolysis of 3,4-Dichloroaniline in Natural Waters." J. Agric. Food Chem. 28:1053 (1980).

G.C. Miller, R.G. Warren, K. Gohre and L. Hanks, "A Gas Chromatographic Method for Determining Strychnine Residues in Alfalfa." J. Assoc. Off. Anal. Chem. 65:901 (1982).

G.C. Miller and W.W. Miller, Eds. "Effect of Sewage on the Truckee River." A symposium published by the University of Nevada, College of Agriculture (1982).

G.C. Miller and R.G. Zepp, "Extrapolating Photolysis Rates from the Laboratory to the Environment." Residue Reviews 85:89 (1983).

G.C. Miller and D.G. Crosby, "Pesticide Photoproducts: Generation and Significance." J. Clin. Toxicol. 19:707 (1983).

G.C. Miller, W.W. Miller, J.W. Warren and L. Hanks, "Soil Sorption and Alfalfa Uptake of Strychnine Applied as an Agricultural Rodenticide." J. Environ. Quality 12:526 (1983).

G.C. Miller and D.G. Crosby, "Photooxidation of 4-Chloroaniline and N-(4-Chlorophenyl)-Benzene-sulfonamide to Nitroso- and Nitro-Products." Chemosphere 12:1217-1227 (1983).

K. Gohre and G.C. Miller, "Singlet Oxygen Generation on Soil Surfaces." J. Agri. and Food Chem. 31:1104-1108 (1983).

R.G. Zepp, P.F. Schlotzhauer, M.S. Simmons, G.C. Miller, G.L. Baughman and N.L. Wolfe, "Dynamics of Pollutant Photoreactions in the Hydrosphere." J. of Fresenius Z. Anal. Chem. 319:119-125 (1984).

K. Gohre and G.C. Miller, "Photochemical Generation of Singlet Oxygen on Non-transition Metal Surfaces." J. Chem. Soc. Faraday Trans. I 81:793-800 (1985).

R.V. Tamma, G.C. Miller and R. Everett, "High-Performance Liquid Chromatographic Analysis of Coumarins and Flavonoids from Section Tridentatae of ***Artemisia***." J. Chromatography 322:236-239 (1985).

K. Gohre, R. Scholl and G.C. Miller, "Singlet Oxygen Reactions on Soil Surfaces." Environ. Sci. Technol. 20:934-938 (1986).

K. Gohre and G.C. Miller, "Photooxidation of Thioether Pesticides on Soil Surfaces." J. Agric. Food Chem. 34:709-713 (1986).

B.R. Smith, G.C. Miller, R.W. Mead and R.E.L. Taylor, "Biosynthesis of Asparagine and Taurine in the Freshwater Prawn, ***Macrobrachium rosenbergii*** (De Man)." Comp. Biochem. Physiol. 87B(4):827-831 (1987).

B.R. Smith, G.C. Miller and R.W. Mead, "Taurine Tissue Concentrations and Salinity Effect on Taurine in the Freshwater Prawn ***Macrobrachium rosenbergii*** (De Man)." Comp. Biochem. Physiol. 87A(4):907-909 (1987).

G.C. Miller and V. Hebert, "Environmental Photodecomposition of Pesticides." In: University of California publication - Fate of Pesticides in the Environment (J.W. Biggar and J.N. Seiber, eds.) Chapt. 8, p. 75-86 (1987).

G.C. Miller and R.G. Zepp, "2,3,7,8-Tetrachlorodibenzo-p-dioxin: Environmental Chemistry." In: Solving Hazardous Wastes Problems: Learning from Dioxins (J.H. Exner, ed.) American Chemical Society Symposium Series 338, Chapter 6, pp. 82-93 (1987).

C.R. Blincoe, V.R. Bohman, G.C. Miller, R.L. Scholl, W.W. Sutton and L.R. Williams, "Excretion and Tissue Concentration of Pentachlorophenol Following Controlled Administration to Cattle." J. Animal Sci. 65 Supplement #1 (1987).

G.C. Miller, V.R. Hebert and R.G. Zepp, "Chemistry and Photochemistry of Low-Volatility Organic Chemicals on Environmental Surfaces." Env. Sci. Tech. 21:1164-1167 (1987).

V.R. Bohman, C.R. Blincoe, G.C. Miller, R.L. Scholl, W.W. Sutton and L.R. Williams, "Biological Monitoring Systems for Hazardous Waste Sites." EPA Final Report #CR 809 787 (1988).

F.M. Wilt, G.C. Miller and R.L. Everett, "Monoterpene Concentrations of Litter and Soil of Singleleaf Pinyon Woodlands of the Western Great Basin." Great Basin Naturalist 48:228-231 (1988).

K. Mongar and G.C. Miller, "Vapor Phase Photolysis of Trifluralin in an Outdoor Chamber." Chemosphere 17(11):2183-2188 (1988).

G.C. Miller, V.R. Hebert and W.W. Miller, "Effects of Sunlight on Organic Contaminants at the Atmosphere - Soil Interface." In: Reactions and Movement of Organic Chemicals in Soils (B. Sawhney, ed.) SSSA Special Publication No. 22, pp. 99-110 (1989).

G.C. Miller, V.R. Hebert, M.J. Miille, R. Mitzel and R.G. Zepp, "Photolysis of Octachlorodibenzo-p-Dioxin on Soils: Production of 2,3,7,8-TCDD." Chemosphere 18(1-6):1265-1274 (1989).

G.C. Miller, "Choosing an Analytical Lab" Nevada Waste Reporter Spring, 1989. (Publication of the Nevada Small Business Development Center).

N.L. Wolfe, U. Mingelgrin and G.C. Miller, "Abiotic Transformation Processes in Water, Sediments and Soils." In: B. Spencer and H.H. Cheng, eds., Pesticides and Other Toxic Organics in Soils, Soil Science Society of America, pp. 103-168 (1990).

S. Donaldson, G.C. Miller and W.W. Miller, "Extraction of Gasoline Constituents from Soil." J. Assn. Off. Anal. Chem. 73:306-311 (1990)

V.R. Hebert and G.C. Miller, "Depth Dependence of Direct and Indirect Photolysis on Soil Surfaces." J. Agric. Food Chem. 38:913-918, (1990)

J.M. Basey, S.H. Jenkins and G.C. Miller, "Food Selection by Beavers in Relation to Inducible Defenses of Quaking Aspens" Oikos 59:57-62 (1990).

S. Donaldson, G. C. Miller, and W.W. Miller, "Volatilization of Gasoline Constituents from Soil. In: Proceedings of the Fourth National Outdoor Action Conference on Aquifer Restoration, Ground Water Monitoring and Geophysical Methods, Las Vegas NV May, 1990.

G.C. Miller, "Nevada's Environmental Commission: Changes Needed for the 1990's" in F. Ballister, Ed. The Nevada Environmental Commission, Published by Claremont College 1991.

S. Kieatiwong, L.V. Nguyen, V.R. Hebert, M. Hackett, G.C. Miller, M.J. Miille and R. Mitzel, "Photolysis of Chlorinated Dioxins in Organic Solvents and on Soils." Env. Sci. Techol. 24:1575-1580, (1990).

M. O. Theisen, G.C. Miller, C. Cripps, M. de Renobales and G.J. Blomquist, "Correlation of Carbaryl Uptake with Hydrocarbon Transport to the Cuticular Surface in the Cabbage Looper, Trichlplusia Ni. Pesticide Biochemistry and Physiology 40:111-116 (1991).

C. Thomas, R.S. MacGill, G.C. Miller, R.S. Pardini, "Photoactivation of Hypericin Generates Singlet Oxygen in Mitochondria and Inhibits Succinoxidase" Photochemistry and Photobiology, 55:47-53, (1991).

G.C. Miller, "Bringing Back the Land: Reclaiming Mining Disturbances" International Mine Waste Management, 1:1-5 (1991)

F. M. Wilt and G.C. Miller, "Seasonal variation of coumarin and flavonoid concentrations in persistent leaves of wyoming big sagebrush (Artemisia tridentata ssp. wyomingensis: Asteraceae) Biochemical Systematics and Ecology, 20:53-67 (1992)

F.M. Wilt, J.D. Geddes, R.V. Tamma, G.C. Miller and R.L. Everett, "Interspecific variation of phenolic concentrations in persistent leaves among six taxa from subgenus Tridentatae (McArthur) of Artemisia L. (Asteraceae)", Biochemical Systematics and Ecology,20:41-52 (1992)

S.G. Donaldson, G.C. Miller and W.W. Miller, "Remediation of Gasoline-Contaminated Soil by Passive volatilization" Journal of Environmental Quality, 21:94-102, (1992)

R.J Watts, B.R. Smith and G.C. Miller, "Catalyzed Hydrogen Peroxide Treatment of Octachlorodibenzo-p-dioxin (OCDD) in Surface Soils", Chemosphere, 23:949-955 (1992)

D. J. Bornhop, L. Hlousek, M. Hackett, H. Wang and G.C. Miller, "Remote Scanning Ultraviolet Detection for Capillary Gas Chromatography" Review of Scientific Instruments, 63:191-201 1992)

B.W. Tyre, R.J. Watts and G.C. Miller, "Effect of Soil Organic Carbon on the Fenton's Reagent Treatment of Four Refractory Compounds" J. Environ. Qual. 20:832-838 (1992)

S. Kieatiwong, G.C. Miller, "Photolysis of Aryl Ketones on Soil: The Effect of Vapor Transport" Environmental Chemistry and Toxicology, 11:173-179, (1992)

S. W. Leung, R.J. Watts and G.C. Miller, "Degradation of Perchloroethylene by Fenton's Reagent:Speciation and Pathway" J. Environ. Quality. 21:377-381 (1992)

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# Curriculum Vitae

**Objective**: To provide diverse and independent research and consulting services to nonprofit, government, legal and industry clients in hydrogeology, groundwater modeling, and water quality with a focus on compliance, NEPA analysis, federal and state regulatory review, and environmental and water policy. There is a particular focus on mining, natural gas development, and water rights issues.

## Education

| Years | Degree | University |
|---|---|---|
| 1992-96 | Ph.D. Hydrology/Hydrogeology | University of Nevada, Reno<br>Dissertation: Stochastic Structure of Rangeland Streams |
| 1990-92 | | University of Arizona, Tucson AZ<br>Classes in pursuit of Ph.D. in Hydrology. |
| 1988-90 | M.S. Hydrology/Hydrogeology | University of Nevada, Reno<br>Thesis: Stream Morphology, Stability and Habitat in Northern Nevada |
| 1981-83 | | University of Colorado, Denver, CO<br>Graduate level water resources engineering classes. |
| 1977-81 | B.S., Civil Engineering | University of Colorado, Boulder, CO |

## Professional Experience

| Years | Position | Duties |
|---|---|---|
| 1993-Pr. | Hydrologic Consultant | Surface, groundwater and systems modeling, hydrogeology studies, stream restoration design, watershed modeling studies and expert testimony for industry, nonprofit groups, and government agencies. |
| 1999-2004 | Great Basin Mine Watch Executive Director | Responsible for reviewing and commenting on mining projects with a focus on groundwater and surface water resources, preparing appeals and litigation, writing reports about mining, fundraising, organizational development, supervision and personnel management. |
| 1992-1997 | University of Nevada, Reno Research Associate | Research on riparian area and watershed management including stream morphology, aquatic habitat, cattle grazing and low-flow and flood hydrology. |
| 1990-1992 | University of Arizona, Tucson Research and Teaching Assistant | Research on rainfall/runoff processes and climate models. Taught lab sections for sophomore level "Principles of Hydrology". Received 1992 Outstanding Graduate Teaching Assistant Award in the College of Engineering |
| 1988- | University of | Research on aquatic habitat, stream morphology and livestock |

Exhibit B

| | | |
|---|---|---|
| 1990 | Nevada, Reno<br>Research Assistant | management. |
| 1983-1988 | US Bureau of Reclamation, Boulder City, NV<br>Hydraulic Engineer | Performed hydrology planning studies on topics including floodplains, water supply, flood control, salt balance, irrigation efficiencies, sediment transport, stream morphology, flood frequency, rainfall-runoff modeling and groundwater balances. |
| 1981-1983 | Faulkner-Kellogg and Assoc., Lakewood Co<br>Design Engineer | Basic drainage, grading and subdivision design. Flood control studies. |

## Peer-Reviewed Publications

Myers, T., 2012. Potential contaminant pathways from hydraulically fractured shale to aquifers. *Ground Water.* doi: 10.1111/j.1745-6584.2012.00933.x

Myers, T., in press. Remediation scenarios for selenium contamination, Blackfoot Watershed, southeast Idaho, USA. *Hydrogeology.*

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Zonge, K.L., S. Swanson, and T. Myers, 1996. Drought year changes in streambank profiles on incised streams in the Sierra Nevada Mountains. *Geomorphology* 15:47-56.

## Representative Reports and Projects

Myers, T., 2012. Technical Memorandum, Review of the Special Use Permit PP2011-035-Camilletti 21-10, Groundwater Monitoring Requirements. Prepared for Route County Board of Commissioners and the Routt County Planning Department. June 19, 2012.

Myers, T., 2012. Testimony at Aquifer Protection Permit Appeal Hearing, Rosemont Mine. Phoenix AZ, August and September, 2012.

Myers, T., 2012. Drawdown at U.S. Forest Service Selected Monitoring Points, Myers Rosemont Groundwater Model Report. Prepared for Pima County, AZ. March 22, 2012.

Myers, T., 2011. Hydrogeology of Cave, Dry Lake and Delamar Valleys, Impacts of pumping underground water right applications #53987 through 53092. Presented to the Office of the Nevada State Engineer On behalf of Great Basin Water Network.

Myers, T., 2011. Hydrogeology of Spring Valley and Surrounding Areas, Part A: Conceptual Flow Model. Presented to the Nevada State Engineer on behalf of Great Basin Water Network and the Confederated Tribes of the Goshute Reservation.

Myers, T., 2011. Hydrogeology of Spring Valley and Surrounding Areas, Part B: Groundwater Model of Snake Valley and Surrounding Area. Presented to the Nevada State Engineer on behalf of Great Basin Water Network and the Confederated Tribes of the Goshute Reservation.

Myers, T., 2011. Hydrogeology of Spring Valley and Surrounding Areas, PART C: IMPACTS OF PUMPING UNDERGROUND WATER RIGHT APPLICATIONS #54003 THROUGH 54021. Presented to the Nevada State Engineer on behalf of Great Basin Water Network and the Confederated Tribes of the Goshute Reservation.

Myers, T., 2011. Rebuttal Report: Part 2, Review of Groundwater Model Submitted by Southern Nevada Authority and Comparison with the Myers Model. Presented to the Nevada State Engineer on behalf of Great Basin Water Network and the Confederated Tribes of the Goshute Reservation.

Myers, T. 2011. Rebuttal Report: Part 3, Prediction of Impacts Caused by Southern Nevada Water Authority Pumping Groundwater From Distributed Pumping Options for Spring Valley, Cave Valley, Dry Lake Valley, and Delamar Valley. Presented to the Nevada State Engineer on behalf of Great Basin Water Network and the Confederated Tribes of the Goshute Reservation.

Myers, T., 2011. Baseflow Selenium Transport from Phosphate Mines in the Blackfoot River Watershed Through the Wells Formation to the Blackfoot River, Prepared for the Greater Yellowstone Coalition.

Myers, T., 2011. Blackfoot River Watershed, Groundwater Selenium Loading and Remediation. Prepared for the Greater Yellowstone Coalition.

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Myers, T., 2009. Monitoring Groundwater Quality Near Unconventional Methane Gas Development Projects, A Primer for Residents Concerned about Their Water. Prepared for Natural Resources Defense Council. New York, New York.

Myers, T., 2009. Technical Memorandum, Review and Analysis of the Hydrology and Groundwater and Contaminant Transport Modeling of the Draft Environmental Impact Statement Blackfoot Bridge Mine, July 2009. Prepared for Greater Yellowstone Coalition, Idaho Falls, Idaho.

Myers, T., 2008. Hydrogeology of the Carbonate Aquifer System, Nevada and Utah With Emphasize on Regional Springs and Impacts of Water Rights Development. Prepared for: Defenders of Wildlife, Washington, D.C.. June 1, 2008.

Myers, T., 2008. Hydrogeology of the Muddy River Springs Area, Impacts of Water Rights Development. Prepared for: Defenders of Wildlife, Washington, D.C. May 1, 2008

Myers, T., 2008. Hydrogeology of the Santa Rita Rosemont Project Site, Numerical Groundwater Modeling of the Conceptual Flow Model and Effects of the Construction of the Proposed Open Pit, April 2008. Prepared for: Pima County Regional Flood Control District, Tucson AZ.

Myers, T., 2008. Technical Memorandum, Review, Record of Decision, Environmental Impact Statement Smoky Canyon Mine, Panels F&G, U.S. Department of the Interior, Bureau of Land Management. Prepared for Natural Resources Defense Council, San Francisco, CA and Greater Yellowstone Coalition, Idaho Falls, ID. Reno NV.

Myers, T., 2007. Groundwater Flow and Contaminant Transport at the Smoky Canyon Mine, Proposed Panels F and G. Prepared for Natural Resources Defense Council, San Francisco, CA and Greater Yellowstone Coalition, Idaho Falls, ID. Reno NV. December 11, 2007.

Myers, T., 2007. Hydrogeology, Groundwater Flow and Contaminant Transport at the Smoky Canyon Mine, Documentation of a Groundwater Flow and Contaminant Transport Model. Prepared for Natural Resources Defense Council, San Francisco, CA and Greater Yellowstone Coalition, Idaho Falls, ID. Reno NV, December 7, 2007.

Myers, T., 2007. Review of Hydrogeology and Water Resources for the Final Environmental Impact Statement, Smoky Canyon Mine, Panels F and G and Supporting Documents. Prepared for Natural Resources Defense Council, San Francisco, CA and Greater Yellowstone Coalition, Idaho Falls, ID. Reno, NV. December 12, 2007.

Myers, T., 2007. Hydrogeology of the Powder River Basin of Southeast Montana Development of a Three-Dimensional Groundwater Flow Model. Prepared for Northern Plains Resource Council. February 12

2007.

Myers, T., 2007. Hydrogeology of the Santa Rita Rosemont Project Site, Conceptual Flow Model and Water Balance, Prepared for: Pima County Flood Control District, Tucson AZ

Myers, T., 2006. Review of Mine Dewatering on the Carlin Trend, Predictions and Reality. Prepared for Great Basin Mine Watch, Reno, NV

Myers, T., 2006. Hydrogeology of Spring Valley and Effects of Groundwater Development Proposed by the Southern Nevada Water Authority, White Pine and Lincoln County, Nevada. Prepared for Western Environmental Law Center for Water Rights Protest Hearing.

Myers, T., 2006. Potential Effects of Coal Bed Methane Development on Water Levels, Wells and Springs of the Pinnacle Gas Resource, Dietz Project In the Powder River Basin of Southeast Montana. Affidavit prepared for Northern Plains Resource Council, April 4 2006.

Myers, T., 2006. Review of Hydrogeology and Water Resources for the Draft Environmental Impact Statement, Smoky Canyon Mine, Panels F and G, Technical Report 2006-01-Smoky Canyon. Prepared for Natural Resources Defense Council.

Myers, T., 2006. Review of Nestle Waters North America Inc. Water Bottling Project Draft Environmental Impact Report / Environmental Assessment. Prepared for McCloud Watershed Council, McCloud CA.

Myers, T., 2005. Hydrology Report Regarding Potential Effects of Southern Nevada Water Authority's Proposed Change in the Point of Diversion of Water Rights from Tikapoo Valley South and Three Lakes Valley North to Three Lakes Valley South. Prepared for Western Environmental Law Center for Water Rights Protest Hearing

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Myers, T., 2004. Technical Memorandum: Pipeline Infiltration Project Groundwater Contamination. Prepared for Great Basin Mine Watch.

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Myers, T., 2001. An Assessment of Diversions and Water Rights: Smith and Mason Valleys, NV. Prepared for the Bureau of Land Management, Carson City, NV.

Myers, T., 2001. Hydrogeology of the Basin Fill Aquifer in Mason Valley, Nevada: Effects of Water Rights Transfers. Prepared for the Bureau of Land Management, Carson City, NV.

Myers, T., 2001. Hydrology and Water Balance, Smith Valley, NV: Impacts of Water Rights Transfers. Prepared for the Bureau of Land Management, Carson City, NV

Myers, T., 2000. Alternative Modeling of the Gold Quarry Mine, Documentation of the Model, Comparison of Mitigation Scenarios, and Analysis of Assumptions. Prepared for Great Basin Mine Watch. Center for Science in Public Participation, Bozeman MT.

Myers, T., 2000. Environmental and Economic Impacts of Mining in Eureka County. Prepared for the Dept. Of Applied Statistics and Economics, University of Nevada, Reno.

Myers, T., 1999. Water Balance of Lake Powell, An Assessment of Groundwater Seepage and Evaporation. Prepared for the Glen Canyon Institute, Salt Lake City, UT.

Myers, T., 1998. Hydrogeology of the Humboldt River: Impacts of Open-pit Mine Dewatering and Pit Lake Formation. Prepared for Great Basin Mine Watch, Reno, NV.

## Selected Abstracts, Magazine and Proceedings Articles

Myers, T., 2012. Participation in: Keystone Center Independent Science Panel, Pebble Mine. Anchorage AK, October 1-5, 2012.

Myers, T., 2012. Mine Dewatering: Humboldt River Update. INVITED PRESENTATION at 2012 Nevada Water Resources Association Annual Conference.

Myers, T., 2012. Reservoir loss rates from Lake Powell, and long-term management of the Colorado River system. 2012 Nevada Water Resources Association Annual Conference

Myers, T., 2011. Reservoir loss rates from Lake Powell, and long-term management of the Colorado River system. 2011 Fall Conference, American Geophysical Union.

Myers, T., 2006. Modeling Coal Bed Methane Well Pumpage with a MODFLOW DRAIN Boundary. In MODFLOW and More 2006 Managing Ground Water Systems, Proceedings. International Groundwater Modeling Center, Golden CO. May 21-24, 2006.

Myers, T., 2006. Proceed Carefully: Much Remains Unknown, *Southwest Hydrology 5(3)*, May/June 2006, pages 14-16.

Myers, T., 2004. Monitoring Well Screening and the Determination of Groundwater Degradation, Annual Meeting of the Nevada Water Resources Association, Mesquite, NV. February 27-28, 2004.

Myers, T., 2001. Impacts of the conceptual model of mine dewatering pumpage on predicted fluxes and

drawdown. In MODFLOW 2001 and Other Modeling Odysseys, Proceedings, Volume 1. September 11-14, 2001. International Ground Water Modeling Center, Golden, Colorado.

Myers, T., 1997. Groundwater management implications of open-pit mine dewatering in northern Nevada. In Kendall, D.R. (ed.), Conjunctive Use of Water Resources: Aquifer Storage and Recovery. AWRA Symposium, Long Beach California. October 19-23, 1997

Myers, T., 1997. Groundwater management implications of open-pit mine dewatering in northern Nevada. In Life in a Closed Basin, Nevada Water Resources Association, October 8-10, 1997, Elko, NV.

Myers, T., 1997. Uncertainties in the hydrologic modeling of pit lake refill. American Chemical Society Annual Meeting, Las Vegas, NV, Sept. 8-12, 1997.

Myers, T., 1997. Use of groundwater modeling and geographic information systems in water marketing. In Warwick, J.J. (ed.), Water Resources Education, Training, and Practice: Opportunities for the Next Century. AWRA Symposium, Keystone, Colo. June 29-July 3, 1997.

Myers, T., 1995. Decreased surface water flows due to alluvial pumping in the Walker River valley. Annual Meeting of the Nevada Water Resources Association, Reno, NV, March 14-15, 1995.

## Special Coursework

| Years | Course | Sponsor |
|---|---|---|
| 2011 | Hydraulic Fracturing of the Marcellus Shale | National Groundwater Association |
| 2008 | Fractured Rock Analysis | MidWest Geoscience |
| 2005 | Groundwater Sampling Field Course | Nielson Environmental Field School |
| 2004 | Environmental Forensics | National Groundwater Association |
| 2004 and -5 | Groundwater and Environmental Law | National Groundwater Association |